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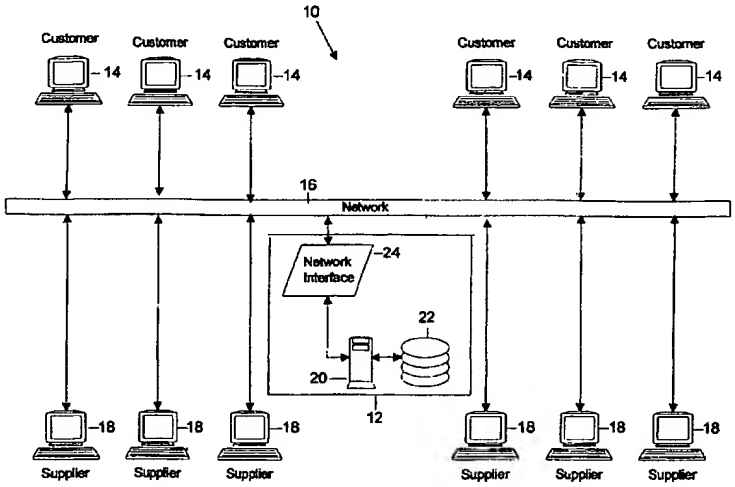

(57) Abstract: A network system (10) and method for enabling automatic price quotations for the production of a product and/or automatic production of a product without the need for a customer to disclose proprietary drawings and specifications to the supplier. One aspect of the invention is directed to a network system (10) and method for obtaining price quotations for the production of a product from suitable supplier members within the network system, wherein the manufacturing details of the product are utilized to develop the price quotation for each supplier member, but are not required to be disclosed to the supplier members for such purpose. Another aspect of the invention is directed to a network system (10) and method for ordering the production of a product whereby the manufacturing details for the product are conveyed to the supplier member in a machine readable form that can be implemented by the supplier member's specific process machinery for immediate production, and subsequent delivery.

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METHOD AND SYSTEM TO OBTAIN AUTOMATIC QUOTATIONS FROM MANUFACTURING DETAILS

Technical Field

The present invention is directed to the field of manufacturing, and is more specifically directed to a network system and method for enabling automatic price quotations for the production of a product and/or automatic production of a product without the need for a customer to disclose proprietary drawings and specifications to the supplier.

Background Art

Over two trillion dollars a year in sales revenue are received by the manufacturing industry in the United States alone for the acquisition of parts and/or assembled products. This revenue flows to original equipment manufacturers, to job shop parts fabricators and other suppliers. Most manufacturers do not make their end product wholly from scratch, but instead purchase certain parts from original parts suppliers and may also outsource certain other production functions to suppliers. For example, in making a car, an automobile manufacturer could obtain the flat sheet metal parts used for the auto body from job shops that specialize in flat metal parts fabrication; obtain valves and other machined parts from machine shops; obtain the fuse boxes, hoses and other plastic parts from injection molders; outsource the welding functions to welding shops; and outsource the painting function to finishing shops.

Some manufacturers may acquire certain parts and outsource certain production functions on a regular basis, or only use certain suppliers when their own production capacity is insufficient to meet current production demand. A large amount of time, effort and money goes into establishing relationships with these suppliers to assure that the suppliers will be able to meet the production demand in terms of process machine capabilities, available capacity and any requisite quality standards. Some manufacturers maintain a certified vendor program wherein the suppliers are required to meet certain standards or requirements before qualifying to serve as a vendor. This type of program requires significant administrative time and effort in maintaining records of the vendors and monitoring the vendors to assure that they continue to meet the requirements. In addition, the certified vendor programs inherently limit the number of available vendors, such that the manufacturer may not get the most competitive pricing available in the marketplace.

Some efforts have been made to reduce the cost to manufacturers associated with maintaining these types of programs and expanding the scope of qualified vendors. For example, suppliers may participate in a certification process known as ISO 9000 which requires the suppliers to meet certain uniform standards for doing business before being ISO 9000 certified. Instead of maintaining its own certification program, a manufacturer could simply require that its suppliers be ISO 9000 certified which, if the population of ISO 9000 certified companies were large enough, would greatly expand the number of quality-certified suppliers to the manufacturer and thus eliminate that part of its research and monitoring for quality purposes. While in theory these uniform certification processes are useful, a number of barriers still prevent manufacturers from broadening the scope of process-qualified available suppliers.

While there are an enormous number of different fabricators, machinists, milling, drilling, lathe shops and other suppliers throughout the United States and the world, a manufacturer is likely familiar with only a limited number of these suppliers in any given area. It would take a tremendous amount of effort to locate all or a large proportion of potential suppliers for any particular project who have the necessary process machinery and available capacity to fulfill an order at any given time. It would also be difficult to then effectively obtain competitive price and delivery schedule quotations from these suppliers within any reasonable amount of time.

Another important barrier in this respect relates to the ability to communicate the manufacturing details for any product or piece/part order to the potential supplier. In order for a supplier to determine whether it has the ability to produce a certain part, and to give an accurate pricing and delivery schedule bid for producing that part, the supplier needs to have the manufacturing details (i.e. the drawings and specifications). There are two key reasons why this presents a barrier to obtaining bids from a large number of suppliers.

First, there is no universal uniform standard by which precise manufacturing details are conveyed. There are a number of proprietary computer aided drawing (CAD) formats used in the industry. Most of these formats can be converted to another format via the use of interfaces such as IGES, DXF or XML (extended markup language). However, in any of these converted formats, the user will assign its own system for denoting specific variables. For example, most CAD formats utilize a system of text, layers, fonts and colors, or any combination thereof, which appear in the drawings to designate a certain process-step used to make that element of the part. The user will designate a certain layer, font or color, or any

combination thereof, to indicate a certain feature. Thus, in one user's drawings a specific layer and color may stand for an etching process, while that same specific color and layer may signify a bending line to another user. In addition, each manufacturer may use special shapes to designate special features on their parts. These shapes are unique to each manufacturer, such that the shapes would not have the same meaning to different users.

A number of other variables will be included in the drawings and/or written specifications, and the manner in which these variables are "coded" will vary from one manufacturer to another. Thus, it is very difficult for a prospective purchaser to obtain bids from a large number of suppliers who are unfamiliar with that purchaser's drawings and specifications, because the purchaser will need to explain the codes it uses to define certain properties. In addition, many suppliers use cost estimating software to provide bids for fulfilling product orders. In order to utilize the software in its most accurate manner, the supplier will need to enter all of the manufacturing details into the supplier system (using its own codes for certain variables) in order to come up with a bid. Thus, either the purchaser or the supplier will have to have the purchaser drawings converted to each different format (including the specific variable codes) for each potential supplier.

A second reason why the need to communicate manufacturing details to potential suppliers inherently limits the number of potential suppliers, is that most manufacturers do not want to provide their proprietary and confidential drawings and specifications to a large number of potential suppliers. Thus, because of concerns for confidentiality supported by a policy of limited disclosure, the manufacturer will likely only submit its drawings and specifications to a limited number of known and pre-qualified suppliers.

Thus, even though there are a large number of suppliers in the United States and throughout the world that have the ability to produce certain parts or provide certain production functions, the commercial reality is that most manufacturers use a limited number of suppliers. This means that the manufacturer may be paying more than need be for certain products or services, and that the manufacturer may be stunted in terms of its overall production capacity and geographical market for sales.

In addition to the manufacturers who purchase products from and outsource certain production functions to suppliers, there are a number of individuals and smaller companies who have a need for made-to-order products. For example, individual inventors and innovative companies who develop a new product idea often need to have a prototype of the product made in order to assess its viability. Generally, they will only want to go to one or

two different suppliers for a price quotation because they do not want to share the idea with a large number of potential suppliers. In addition, the cost of obtaining the prototype can be very high because the supplier has to put in the same amount of effort for tooling or configuring its machinery to make the part as it would for high volume orders. There is a similar cost barrier for hobbyists who need a single made-to-order part for their model plane or classic automobile.

In view of the foregoing, it is believed that there is a need in the manufacturing industry for a method to efficiently and precisely communicate the manufacturing details for a specific part or fabricated product to a supplier without the cost of time and effort to reconcile the common disparities in CAD drawing characteristics. There is also a need for a system which would enable prospective purchasers of parts, fabricated products and/or production services to expand the scope of available suppliers to obtain more competitive pricing. Also, there is a need for a system to enable manufacturers to expand into new geographic markets and/or increase overall capacity and avoid the traditional large investments in bricks and mortar, machinery, personnel, planning, market research, etc. Lastly, there is a need for a system that will enable those prospective purchasers to obtain price quotations for the cost of obtaining parts, fabricated products and/or production services from a large number of suppliers without divulging proprietary and confidential manufacturing details to the suppliers.

Disclosure of Invention

The above needs as well as others are met by a network system having a plurality of supplier members who are in the manufacturing business, wherein customers are able to easily and automatically obtain price quotations for the production and delivery of products from all of the suitable supplier members within the network system. Another aspect of the network system enables customers to order the production and delivery of products from one or more supplier members within the network system and to automatically convey the precise manufacturing details of the products to the supplier member in a machine readable form that can be implemented by each supplier member's specific process machinery for immediate production.

For purposes of this description, it should be understood that "product" shall mean any component, piece/part or fabricated product, and that "production" of a product may encompass the manufacture of the product, or the provision of certain services in relation to production of the product such as press-brake bending, welding, painting and/or assembly.

"Customers" utilizing the network system may include manufacturers, inventors, hobbyists, and any other individuals, companies or other entities. Customers may consist of may corporations, manufacturers or other unrelated entities; they may consist of the manufacturing plants and/or subsidiaries of a single corporate entity; or they may consist solely of a single entity such as a manufacturing plant. Suppliers may include original equipment manufacturers, job shops, and any other individuals, companies or other entities who supply products or services relating to the production of products, or to the business of manufacturing. In the preferred embodiment, the network system is particularly well adapted for ordering the production of piece/parts fabricated from 2-dimensional materials by job shops or other suppliers

The method of the present invention for obtaining price quotations for the production and delivery of products from supplier members of the network system comprises the steps of: (1) collecting supplier member information from at least one supplier member regarding the supplier member's machinery process capabilities and pricing formulae used to calculate the price for production and delivery of products; (2) obtaining from a customer the manufacturing details for the product to be produced with sufficient specificity to enable production of the product; (3) searching the collected information to determine which supplier members have the process capabilities for production of the product; (4) calculating the price for which each suitable supplier member can produce the product based upon the pricing formulae provided by the supplier member; and (5) conveying the calculated pricing for each supplier member to the customer.

Other types of information may also be collected, searched, calculated and/or conveyed to or from the supplier members and customer. For example, delivery formulae and/or available capacity information may be collected from each supplier member for use in determining a specific date on which the product may be delivered. In addition, certification information may be collected from each supplier member such that the collected information can be searched to determine which supplier members meet the certification prerequisites of the customer.

The process may also optionally include further steps for ordering production of the product including: (6) receiving an order from the customer for a specific supplier member to produce the product; (7) conveying the order to the specific supplier member for acceptance; and (8) upon acceptance of the order, conveying the manufacturing details for production of the product to the supplier member.

An inventive method for ordering the production of a product from one or more supplier members within a network system comprises the steps of: (1) collecting supplier member information from at least one supplier member regarding the supplier member's machinery process capabilities; (2) obtaining an order from a customer for the production of one or more products by a specific supplier member; (3) obtaining the manufacturing details for the product desired to be produced with sufficient specificity to enable production of the product; (4) converting the manufacturing details into machine readable instructions that can be implemented by the specific process machinery of the supplier member; and (5) conveying the machine readable instructions to the supplier member for production of the product.

A preferred network system in accordance with the present invention comprises at least one host computer, at least one supplier member database connected to the host computer, and at least one customer computer connected via a computer network to the host computer. The computer network may be an open, existing public network such as the Internet that is accessible by an unlimited number of customers and supplier members; it may also be a privately owned intranet that restricts access to a limited group of customers and suppliers; or it may be various combinations of a public network and private networks. The supplier member database includes information respecting each supplier member of the network system including machinery process capabilities and pricing formulae, as well as optionally including delivery formulae, available capacity information and any special certifications of the supplier members. The host computer is preferably programmed to enable each supplier member to access that supplier member's information on the supplier member database, and to modify or add information to the supplier member's database.

A customer may desire to obtain a price quotation for production of a product from all of the suitable supplier members within the network system, and/or may desire to place an order for production of a product with one or more of the supplier members within the network system. In either event, the manufacturing details of the product will be described in a pre-existing computer aided drawing (hereinafter "CAD drawing"). To obtain a price quotation and/or order production of the product from one or more supplier members of the network system, this pre-existing CAD drawing is converted into a uniform drawing such that each manufacturing detail denoted in the pre-existing drawing is converted into a pre-defined standard code of designation for that manufacturing detail. These details may be denoted in the drawings by geometric lines, layers, fonts, colors, text and combinations thereof. The details may include part geometry, processing edge quality (denoting a specific process such

as laser, or an option of limited process types), grain orientation, raw materials used to make the product, welding requirements, part identification numbers, quantity, delivery date and the like.

The conversion process may be accomplished by the customer computer or the host computer, wherein the computer is programmed to receive the pre-existing CAD drawing and prompt the customer to input conversion information into the computer to indicate what specific designation is used in the pre-existing CAD drawing for each manufacturing detail denoted in the drawing. The computer is programmed to receive the conversion information from the customer, and to cause each designation in the pre-existing CAD drawing to be converted to a pre-defined standard code of designation for the manufacturing detail denoted.

In circumstances where a customer has a number of pre-existing CAD drawings for one or more products where the designations used to denote certain manufacturing details are the same in each drawing, the computer is programmed to prompt the customer, through a single series of prompts, to input the conversion information that uniformly applies to all of the drawings. Then, the computer offers opportunity to the user to receive all of the pre-existing drawings in an automatic batch mode. The computer is programmed to then automatically convert the designations used uniformly in all of the pre-existing drawings to the pre-defined standard code of designation via batch processing.

If the drawings are converted on the customer computer, the customer computer is programmed to transmit the converted uniform drawings to the host computer. The host computer is programmed to check the uniform drawing to determine the machinery process capability requirements needed for production of the product. The host computer is programmed to then search the supplier member database(s) to locate all of the supplier members who have the requisite process capabilities and any other prerequisites such as specific certification requirements.

The host computer is programmed to then automatically calculate the price for which each supplier member can produce the product based upon the pricing formulae for each supplier member in the supplier member database. The host computer may optionally be programmed to also calculate the anticipated delivery date on which each supplier member can deliver the product based upon delivery formulae and/or available capacity information for each supplier member in the supplier member database. The host computer is programmed to provide the calculated pricing and, optionally the delivery times, for each supplier member to the customer, preferably using a filter screen that allows the customer to

set certain parameters to filter out those quotations that do not meet the expectations of the customer. For example, it is anticipated that there may be hundreds of supplier members that may qualify to meet the requirements of production for a particular customer, and the customer may want to look at only the top ten that meet the customer-set parameters.

The host computer is also programmed to receive an order from the customer for production of the product by a specific supplier member, and to cause the order to be sent to the supplier member for acceptance. The host computer is programmed to receive an acceptance of the order from the supplier member, and, responsive to that acceptance, to automatically convert the uniform description of the product to machine readable instructions that can be implemented by the specific process machinery of the supplier member. The host computer is also programmed to automatically direct electronic payment from the customer to the supplier upon acceptance of the manufactured product.

Preferably, the host computer calculates the pricing and, optionally, the delivery times for each qualified member supplier by first converting the uniform drawing to numerical control or computerized numerical control (hereinafter "NC/CNC") instructions as applicable to the specific process machinery controller(s) of that supplier member. Detailed processing figures can then be derived from the NC/CNC instructions including the amount of raw material needed to produce the product, the amount of labor and machine time, and the amount of additional processing time such as for programming, tool changes, material handling and the like. These figures are then input into the pricing along with the specified profit-margin, and, optionally, delivery formulae for the member supplier to calculate the pricing and optionally delivery times. In a most preferred embodiment, the NC/CNC instructions in the form of a nest in machine readable language specific to the supplier member's process machinery controller(s) may be downloaded to the supplier member's computer by the host computer upon acceptance of the order. To meet changing production requirements, a new nest incorporating other products required to be produced by supplier can be recreated on the demand of the supplier member. This gives full flexibility to produce the product on schedule in exact quantities at the lowest cost. These instructions can then be transmitted via the supplier member's direct numerical control (DNC) software to the specific process machinery controller(s) on the factory floor to expedite processing of the order.

The network system may include a number of other features including a means for providing engineering services to assist the customer in preparing CAD drawings for the product; a means for enabling direct electronic payment to the member supplier upon delivery

or acceptance of the product so as to eliminate the need for invoicing, payment processing and collection; a means for enabling the prospective purchaser to obtain general information on any of the supplier members before making an ordering decision; a means for collecting purchaser satisfaction data respecting specific supplier members and providing such data to customers; and a means for order tracking to provide customers with the current status of their order.

This network system enables a customer to obtain accurate pricing quotes from a large number of suppliers throughout the world without having to actually disclose the proprietary drawings and specifications for the product to each of the suppliers. Similarly, supplier members have the opportunity to provide price quotations in response to requests submitted from a wider variety of sources without expending the time, effort and expense associated with marketing to such a large group of potential customers, redrawing parts and learning the potential customer's design standards. The supplier members can regularly adjust their pricing formulae, thus utilizing available capacity for maximum profitability, while the customers are likewise able to take advantage of a wider range of competitive pricing and qualified production suppliers.

This system is in essence a virtual factory, which brings together a full range of manufacturing resources and capabilities from all over the world. This system will enable manufacturers to expand capacity and to expand into new geographic markets which they may not otherwise be able to do, because they can use third party suppliers for expansion which requires significantly less resources than building or purchasing their own factory and equipment and hiring personnel to staff the facility. Furthermore, if a manufacturer customer utilizes the network system to have product produced and delivered in a new territory which proves unprofitable, then the customer can simply cease ordering production within that area with no additional costs incurred. The suppliers are able to produce the parts with accuracy without risk of misinterpretation which can happen with conventional redrawing methods. The supplier saves great expense by receiving the NC/CNC programming ready to produce and eliminating the cost associated with conventional invoicing and collections.

The network system may be an open public network existing on the Internet and accessible by an unlimited number of customer members and supplier members. Alternatively, the network system may be a closed, privately owned intranet that restricts access to only a single manufacturing entity's plants, subsidiaries and suppliers. An intranet network system allows a manufacturing entity to create a large supplier database and allow its

plants to subsidiaries to share information regarding these suppliers. In addition, the manufacturing entity is able to maintain an additional level of security for its proprietary designs.

Brief Description of Drawings

Figure 1 is a schematic diagram of a network system in accordance with a preferred embodiment of the present invention.

Figure 2 is an example of a host Web site home page for a network system in accordance with a preferred embodiment of the present invention.

Figure 3 is a flow chart of the member enrollment process for a network system in accordance with a preferred embodiment of the present invention.

Figure 4 is a display of an interactive cost model form in accordance with a preferred embodiment of the present invention.

Figure 5 is a listing of processing variables that may be included in the pricing formulae of the cost model in accordance with a preferred embodiment of the present invention.

Figure 6 is a flow chart showing a process for obtaining a price quotation and ordering production of a product using a network system in accordance with a preferred embodiment of the present invention.

Figure 7 is a flow chart showing a conversion process for converting CAD drawing files to uniform drawing files in accordance with a preferred embodiment of the present invention.

Figure 8 is an interactive font, layer and color form used in the conversion process in accordance with a preferred embodiment of the present invention.

Figure 9 is an interactive pre-programmed indicia form used in the conversion process in accordance with a preferred embodiment of the present invention.

Figure 10 is an interactive tool selection screen display used in the conversion process in accordance with a preferred embodiment of the present invention.

Figure 11 is an exemplary screen display of a quotation compilation generated by the network system in accordance with a preferred embodiment of the invention.

Best Mode for Carrying Out the Invention

Looking to Fig. 1, a network system in accordance with a preferred embodiment of the present invention is generally denoted by the numeral 10. The network system comprises at least one host computer 12, at least one customer member computer 14 computer connected

via a communications network 16 to host computer 12, and at least one supplier member computer 18 connected via communications network 16 to host computer 12. Member computers 14 and 18 are preferably connected to host computer 12 via an Internet connection using a public switched phone network. Alternatively, the connection may be provided by dedicated data lines, cellular, Personal Communication Systems ("PCS"), microwave or satellite networks.

The network system can be an open, public network existing on the Internet; a closed, privately owned intranet network; or various combinations of the two. Setting up the network system to use the Internet allows an unlimited number of customers and suppliers to use the system. Any entity looking for a supplier could use the network in an attempt to find the best price to purchase manufactured goods. Member suppliers would compete for the business of every customer that used the public network. Alternatively, setting up the network system as an intranet network would allow a customer or limited number customers to choose the suppliers that are available to bid on available jobs. In addition, by setting up the network system as an intranet, access to the system is restricted. For instance a customer may desire to set up the network system to limit access to its manufacturing plants, subsidiaries and suppliers.

An intranet is a private network that uses the Internet's TCP/IP protocols for its underlying transport. For extra security, these intranet-to-intranet transactions need never go out over the public Internet, but can travel over private leased lines instead. The additional security of an intranet network allows the customer to take advantage of a large number of suppliers bidding for production of a product without exposing proprietary information to unwanted third parties.

In the preferred embodiment shown in the drawings, host computer 12 includes at least one server 20, at least one data storage device 22 and a network interface 24. Server 20 comprises a high speed central processing unit (CPU), an operating system and random access memory (RAM) configured in any conventional server configuration using a personal computer (PC) or computer workstation with sufficient memory and processing capability. In the preferred embodiment, server 20 acts as an HTTP web server, and network interface 24 comprises a site on the World Wide Web portion of the Internet for communicating with member computers 14 and 18. Conventional web server software is loaded on server 20 to enable communications with member computers 14 and 18. IBM compatible PCs, Windows based PCs, Macintoshes, or UNIX based server configurations known in the art are considered

suited for these purposes, such as the Dell PowerEdge 8450 system available from Dell Computers.

While the embodiment shown in the drawings displays a single server 20 and data storage device 22, it should be understood that the functionality of host computer 12 can be distributed over a plurality of servers and databases housed together or in separate units or locations. It is anticipated that server 20 will comprise or serve as a number of different types of servers including a web server for sending and receiving HTTP requests to member computers, an applications server for running various applications programs used in the network system, a database server for querying the host databases responsive to requests, and a file transfer protocol (FTP) server for enabling file transfers between the host computer and member computers.

Data storage device 22 may include hard disk magnetic or optical storage units as well as CD-ROM drives or flash memory. Data storage device 22 contains databases used in performing operations of the system including a customer member database, supplier member database, request for quotes (RFQ) database, machine library database, material library database, tool library database, welding library database, paint and finish library database, price quotation database, order database, supplier download database, customer satisfaction database, job status database, and payment transactions database.

In addition to the standard operating system and communications software loaded on server 20, a number of executable application software programs are loaded on server 20 to enable host computer 12 to perform network specific processes including member enrollment, drawing conversion, NC/CNC part and nesting programming, price quotation calculation, order entry and acceptance, customer satisfaction tracking, order tracking and electronic payment software programs.

The databases are preferably used externally from the web server software and other executable application software programs through the use of a standard interface such as system query language (SQL) or common gateway interface (CGI) as is known in the art.

Customer member database maintains data on customer members, including member identifier ("ID") number, name, address, phone number, electronic mail (e-mail) address, Web site URL address, primary contact, password, debit payment data, including bank and account number, electronic payment authorization, and membership contract agreement.

Supplier member database maintains data on supplier members, including member identifier ("ID") number, name, address, phone number, electronic mail (e-mail) address, Web

site URL address, primary contact, password, process machinery and controller data, material listings, tool listings, cost model, delivery model, special certifications, credit payment data, including bank and account number, and membership contract agreement.

The data contained within the member databases is obtained when the member originally enrolls as a member of the network system. Host computer 12 is programmed to enable each member to access it's data in these databases, and to modify or add information in its database using HTML forms or other local software tools provided to the member for use on member computers 14 and 18. Member computers 14 and 18 will collect the data to be added or changed and upload the new data to host computer 12 for storage in the respective database. The specific software tools used preferably allow a member to download the portion of the database which pertains to that member, modify it locally and upload the modified data to the database.

RFQ database stores data on each price quotation requested by a customer member including member ID number, RFQ ID number, uploaded drawing files, order information and date of RFQ.

Machine library database stores data describing all processing parameters and NC/CNC programming requirements for each specific process machine that may be used by a supplier member in the production of products.

Material library database stores data describing the characteristics of each different type of material that may be used by a supplier member in the production of products.

Tool library database stores data for each different type of punch process machine that may be used by a supplier number, including describing the various sizes of standard shaped and special shaped tools, and the specific shapes used to designate specific tools or groups of tools.

Welding library database stores data describing the characteristics of each different type of welding process that may be used by a supplier member in the production of products, including shapes and welding symbols used to designate specific welding processes.

Paint and finish library database stores data describing the characteristics of each different type of paint or finish, and the method of application that may be used by a supplier member in the production of products.

Price quotation database archives price quotations conveyed to a customer member responsive to an RFQ including RFQ ID number, price quotation date, customer member ID number, and the content of each price and delivery quotation by Supplier member ID number.

Order database tracks any orders submitted by a customer member responsive to a price quotation and any acceptances of those orders including RFQ ID number, order ID number, order date, customer member ID number, supplier member ID number, acceptance date, and whether or not the order has been completed.

Supplier download database archives the NC/CNC machine-readable files downloaded to supplier for the production of an order including RFQ ID, order ID, customer member ID number, supplier member ID number, date of download, and copies of NC/CNC files.

Customer satisfaction database tracks the performance of supplier members including product quality, packaging quality, timely delivery, customer service, and resolution of disputes. This data may be obtained from questionnaires regularly sent to customers who have purchased production services using the network system, or the customer may be otherwise prompted to input a level of satisfaction for a particular supplier with or without comments.

Job status database tracks the status of accepted production orders. This data may be obtained from the supplier member who regularly forwards status updates to the host computer. In a preferred embodiment, the host computer will regularly receive order status and capacity information from software at supplier member's facilities for tracking the progress of orders, without the need for manual entry by the supplier member.

Payment transactions database is used to record electronic payments made upon the completion of an order. This database will include the customer member ID number, the supplier member ID number, the order ID number, date of acceptance, record of acceptance, date of payment and record of payment.

It should be understood by one skilled in the art that the data and files stored in the foregoing databases may be stored in any number of different databases than described above without departing from the scope or intent of the invention, as long as the data and files can be obtained for use in the processes described herein.

Member computers 14 and 18 interface with network interface 24 vi a modem or network and communicate with host computer 12. In the preferred embodiment shown in the drawings, any conventional computer capable of running a web browser will suffice including a personal computer (PC), lap top, computer workstation, WebTV television set or personal digital assistant such as a hand held digital device. It is also anticipated the member computers 14 and 18 may be dumb terminals wherein the web browser software runs off of host computer 12 or some other dial-in computer. Preferably, member computers 16 and 18

comprises a personal computer having an input device, such as a keyboard, mouse or conventional voice recognition software package; a display device such as a video monitor and video card; a processing device such as a CPU; and a network interface such as a modem or network card. There are many commercially available web browser software applications that can enable communications by the members with the host computer including Netscape Navigator® available from Netscape Corporation, and Internet Explorer® available from Microsoft Corporation.

In use, a member or prospective member of the network system first obtains access to Internet network 16 via an on-line service provider such as AOL or CompuServe, a local area Internet service provider (ISP), a direct connection to a local area network (LAN) or integrated services digital network (ISDN), WebTV, a cable modem connection, a satellite modem connection or any other means known in the art. The member or prospective member then forwards a request to host computer 12 to view the host Web site by inputting into member computer 14 or 18 the main URL address for the host home page. Host computer 12 receives the HTTP request to access the home page identified by a main URL address and sends the host home page to member computer 14 or 18 for display on the member computer screen. The host home page includes several links on which the member can "click" to select certain information or services.

Fig. 2 displays a sample home page of host computer 12 which has icon links for general information 54, member enrollment 56, member services 58, member activities 60, additional services 62, and member assistance 64. These icon links will appear on the home page and any other pages of the Web site along with an icon link for the home page, so that the member or prospective member can go to a different feature or to the home page at any time while on any page on the Web site.

If the member or prospective member selects general information link 54, host computer 12 will send an informational page to member computer 14 or 18 for display on the member computer screen. This information page will generally explain the network system, and how to navigate in the system to access certain resources. This information page may include links to additional information pages such as a listing of members, links to member sites, terms of membership, and ancillary products or services offered on the network system.

Fig. 3 depicts the process for member enrollment which may be selected by clicking on icon member enrollment link 56. In this process, interactive forms using SQL or CGI applications will be sent to member computer 14 or 18 by host computer 12 for display on the

member computer screen. These interactive forms may use various methods of collecting data including prompting the use to enter text or to select from entries listed on pull-down menus. Information entered by the prospective member is submitted to host computer 12 and saved as a file in the appropriate database. Subsequent interactive forms or HTML documents will be generated in response to the data submitted by the prospective member.

Looking to Fig. 3 in step 66 of the member enrollment process, a membership information page is displayed on the member computer screen generally describing the enrollment process. In step 68, the prospective member is prompted to indicate whether it desires to be a customer member or supplier member. If the prospective member indicates that it desires to be a customer member, in step 70, customer member is prompted to register by filling out a membership form. The membership form will request identification information including the user name, business name, address, phone number, fax number, e-mail address, Web site URL address and a contact name. In step 72, host computer 12 assigns a member identification (ID) number to the member. The member ID number is stored along with the customer membership information in customer member database.

In step 74, host computer 12 is programmed to display a customer membership contract form on the screen of customer member computer 14. This agreement form includes all of the terms and conditions under which the customer member is entitled to participate in the network system. For example, the member may be required to agree to timely pay any membership fees and amounts due for purchases made using the network system. The member may also be required to agree to be bound by any contracts consummated using the network system and to follow certain procedures for dispute resolution. The member may be required to acknowledge its agreement to all of the terms and conditions and transmit its acknowledgment to the host computer by clicking on an icon titled "I Agree" and/or providing an electronic signature.

In step 76, the customer membership contract is submitted to the host computer along with evidence of customer member's agreement for storage in customer member database under the customer member ID number.

In step 78, host computer 12 is programmed to display a payment information form on the screen of member computer 14. The payment information form may include information about any membership fees, and methods of payment for purchases of products or services ordered using the network system. The customer member will be prompted to enter information about the manner in which the member intends to pay for fees and purchases.

Acceptable methods of payment may be selected from a menu including credit card, electronic funds transfer, digital money, or any other electronic payment method known in the art. The customer member will be prompted to enter payment data corresponding to the selected method of payment. For example, if the member wants to pay by credit card, payment data would include credit card account number, expiration date, name of issuing institution and credit limit. For electronic funds transfer, payment data may include the name of the member's bank and account number, and the method by which such transfer is authorized.

In a preferred embodiment of the invention, all purchases ordered through the network system are automatically paid for once the customer member confirms receipt of the order, or the supplier member provides proof of delivery and/or acceptance. In this embodiment, the customer member will be prompted to provide an electronic signature authorizing electronic payments to be debited from its account and credited to the supplier member's account upon such proof of delivery and/or acceptance.

In step 80, the financial payment information is submitted to host computer 12 and stored in customer member database under the member ID number.

In step 82, host computer will verify the customer identification and payment information through various means known in the art including conducting a credit and background check as authorized by the membership contract. Upon verification, host computer assigns a customer password unique to that customer member for use in accessing certain services and/or resources of the network system.

In step 84, the host computer is programmed to send confirmation of membership to the customer member including the member ID number and password via e-mail or by any other means known in the art such as by certified mail. The password may be assigned as a permanent password, or the password may be temporary so that the member can enter a preferred password within a certain number of days of the receipt of the member confirmation.

If, alternatively, the prospective member indicates that it desires to be a supplier member, in step 86, customer member is prompted to register by filling out a membership form. The membership form will request identification information including the user name, business name, address, phone number, fax number, e-mail address, Web site URL address and a contact name. In step 88, host computer 12 assigns a member identification (ID) number

to the supplier member. The member ID number is stored along with the supplier membership information in supplier member database.

In step 90, host computer 12 is programmed to display a supplier membership contract form on the screen of supplier member computer 18. This agreement form includes all of the terms and conditions under which the supplier member is entitled to participate in the network system. For example, the member may be required to agree to timely pay any membership fees, and to provide production services in accordance with certain standards. The supplier member may also be required to agree to be bound by any contracts consummated using the network system and to follow certain procedures for dispute resolution. The member may be required to acknowledge its agreement to all of the terms and conditions and transmit its acknowledgment to the host computer by clicking on an icon titled "I Agree" and/or providing an electronic signature.

In step 92, the supplier membership contract is submitted to the host computer along with evidence of supplier member's agreement for storage in supplier member database under the member ID number.

In step 94, host computer 12 is programmed to display a payment information form on the screen of supplier member computer 18. The payment information form may include information about any membership fees, and methods of payment for purchases of products or services ordered using the network system. The supplier member will be prompted to enter information about the manner in which the member intends to pay for the membership fees similar to the process described above with respect to customer financial payment information. Supplier member will also be prompted to provide the name of the bank and account number to which payment for its production services should be credited.

In step 96, the financial payment and receipt information is submitted to host computer 12 and stored in supplier member database under the member ID number.

In step 98, host computer will verify the supplier identification and payment information through various means known in the art including conducting a credit and background check as authorized by the membership contract. Upon verification, host computer assigns a password unique to that supplier member for use in accessing certain services and/or resources of the network system.

In step 100, host computer 12 is programmed to display a target machine and controller information form which prompts the supplier member to submit information about its process machinery. The supplier member will be prompted to enter information about the

number and type of process machines that it uses in production. This data entry may be accomplished using a series of pull down menus. For example, there are a number of different categories of machines used in the production of piece/parts from 2-D sheet material, including ultrasonic knife, reciprocating knife, laser, oxy-fuel flame, plasma flame, waterjet, punch only, punch with laser, punch with plasma, stack router, etc. These general categories may be displayed in a menu to be selected by the supplier member. Upon selecting a specific category, a new window will be displayed listing the various manufacturers of that type of machine. For example, if the user selects laser, a new menu will be displayed listing the name of each laser machine manufacturer. Upon selecting a specific manufacturer, a new window will be displayed listing the machine model name, make and model number, and the NC/CNC controller make and model number of each laser machine produced by that manufacturer. The supplier member will then be prompted to select the correct machine/controller listing and to indicate how many of those machine(s) it uses in production.

In step 102, the supplier member will be prompted to indicate whether it has provided information on all of its machines. If the supplier member answers "no", then it is routed back to step 100 until information on all of the process machines is submitted.

In step 104, the target machine and controller information is submitted to the host computer and stored in supplier member database under the supplier member ID number.

In step 106, supplier member is prompted to enter information about the specific types of materials that it uses and/or is willing to acquire for use in production. This information will be selected from list box menus listing all of the types of materials included within material library database. For example, for most piece/parts, the material used by a job shop will include flat sheets of material. The supplier member will need to indicate all the various types of material and the forms in which those various types are obtained. The supplier member is also prompted to provide a complete description of any standard and special tooling that is has available for use in any punch press processes including the shape and size of each tool. The supplier member is also prompted to indicate whether it is willing to purchase other tools if needed in order to produce an ordered part. Optionally in step 106, supplier member may be prompted to provide information about any other production capabilities including welding, forming, assembly, painting or finishing capabilities.

In step 108, the materials, tooling and other production information is submitted to host computer for storage in supplier member database under the supplier member's ID number.

In step 110, host computer 12 is programmed to send a cost model form for display on the screen of supplier member computer 18. The cost model form prompts the supplier member to enter cost data and formulae that will be used to calculate a price quotation responsive to an RFQ. Fig. 4 shows a sample cost model form 112 that may be used for this purpose.

Form 112 includes an array of text windows 114 for entry of any number of business variables and associated values to be considered in calculating the price quotation. These business variables are determined solely by the supplier member and may include business related factors such as overhead, profit, raw material costs, labor costs and machine time costs per hour per specific machine. The name assigned to any given business variable is entered into a variable name window 116, and a specific value assigned to that business variable is entered in the companion value window 118. In this manner, the member is able to define values that are unique to its business.

Form 112 also includes a formulae window 120 wherein the supplier member provides the pricing formulae that should be used in automatically developing a quotation for production of a product responsive to an RFQ. These pricing formulae may include the business variables created by the supplier member in text windows 114, and may also include processing variables selected from processing variable menu 122.

The processing variables listed in processing variable menu 120 are discrete elements associated with the production or delivery of a product, which can impact the overall cost of producing and delivering the product. Fig. 5 includes a sample listing of different processing variables that may be included within the pricing formulae. The value associated with each processing variable will be derived from the product description provided by the customer member, and will therefore vary depending upon the product being produced.

As shown in Fig. 4, a variety of formulae may be used to calculate the total price quotation including material cost, machine time cost, labor cost, delivery cost and packaging cost. Of course, it should be understood that a wide variety of formulae may be used for the calculations and these formulae may be adjusted by the supplier member from time to time depending upon current available capacity, other factors affecting supplier member's business, or other factors in the marketplace.

Looking back to Fig. 3, in step 124, once the cost model data has been submitted, host computer 12 is programmed to back-test the formulae to determine the accuracy and integrity of the model. This is achieved by having the supplier member enter in sample RFQ data in

order to obtain a sample quotation. It is suggested to use an order description recently completed by the supplier so that the supplier can properly determine if the resulting quotation is acceptable. Upon entry of the RFQ data, the host computer will prepare a price quotation using the pricing formulae supplied by the supplier member in accordance with the quotation process hereinafter described.

In step 126, the calculated price quotation is transmitted for display on supplier member computer and the supplier member is prompted to indicate whether or not it approves the quotation. If the supplier member does not approve the quotation, it is routed back to step 110 to modify the cost model information. If the supplier member approves the quotation, in step 128, the cost model information is transmitted to host computer 12 and stored in supplier member database under the supplier member ID number.

In step 130, host computer 12 is programmed to send a delivery model form for display on the screen of supplier member computer 18 which prompts the supplier member to enter delivery variables and formulae to be used in calculating the time of delivery for the product. The supplier member will periodically update the delivery model based on current available capacity. In a preferred embodiment, the DNC software on the supplier member's process machines will monitor the machine capacity and automatically provide updated information to host computer 12. Host computer 12 is programmed to then update the delivery information in supplier member database. The delivery variables may include the location from which supplier member product will be shipped, the time for shipment based upon distance of delivery, and available capacity information tied to the amount of time currently required for the supplier member to complete production of a given order size. The delivery variables will be established by the supplier member and can be changed by the supplier member from time to time based upon its current available capacity or changes in delivery structure. The delivery formulae may also include processing variables derived from the order information. These processing variables may include the location of requested delivery, and machine time calculations. The delivery model information is submitted to host computer 12 and stored in the supplier database under the member ID number.

In step 132, host computer 12 is programmed to send a certifications form for display on the screen of supplier member computer 18 which prompts the member to enter information about any specific qualifications or certifications of the member. For example, the member may confirm that it is ISO 9000 certified or that it is an approved vendor for certain customers. This information is preferably entered via the selection of specific

qualifications or certifications listed on a menu. The certifications information is transmitted to host computer 12 and stored in supplier member database under the member ID number.

In step 134, host computer 12 is programmed to send confirmation of membership to the supplier member including the member ID number and password via e-mail or by any other means known in the art such as by certified mail. The password may be assigned as a permanent password, or the password may be temporary so that the supplier member can enter a preferred password within a certain number of days of the receipt of the member confirmation.

An important aspect of the network system of the present invention is that customer members can obtain automatic price and delivery quotations for the production of a product from a large group of supplier members without disclosing the proprietary and trade secret drawings or other detailed specifications for the product to each supplier member. This is unique insofar as other on-line quotation or bidding systems require the customer to provide the drawings to each specific supplier member from whom it wants a quote and, in most instances, to have the drawings converted to each specific supplier member's format before being able to obtain a quote. Another aspect of the invention of the network system allows customer members to order the production of a product and to automatically convey the specific NC/CNC instructions needed for production of the product by that specific supplier member's machinery. This enables the supplier to automatically produce the product without the need for the proprietary drawings and specifications. These quotation and product ordering services may be accessed by the customer member by clicking on the member activities icon 60 on the home page (Fig. 2.).

In order to obtain a quotation and/or order production of a product using the network system, the customer member's description of the product to be produced in the form of a CAD drawing must first be converted to a uniform description using a pre-defined code of designation for each manufacturing detail. This uniform description is then used to automatically develop a price and delivery quotation for each supplier member of the network system based upon the cost and delivery models of the supplier member. For purposes of this invention, manufacturing details encompass all of the various aspects of the product and methods of production needed to enable a supplier to make the product and/or provide production services relative to the product. The manufacturing details include part geometry; bends including angle and radius of the bends; process edge quality; raw materials used to make the part; forming and machining operations used to make the part; bevel requirements;

hole tolerances; markings; roll-forming patterns; surface finish requirements; paint specifications; welding requirements; fastener requirements; add on components; and assembly requirements.

In order to convert the CAD drawings of the customer member to the network's uniform description for purposes of obtaining a price quotation, the customer will need to provide conversion information indicating what designations are used in its drawings to denote specific manufacturing details. Insofar as most manufacturers internally use their own standard code of designations applied to all piece/part drawings, this information may only need to be provided once in order to convert all of its CAD documents to the uniform description used by the network system. This method of "batch" conversion wherein the conversion data is entered once to establish a conversion model and then used to convert any subsequent drawings of the customer member is described herein as the preferred embodiment of the invention. However it should be understood that the conversion process can alternatively be performed separately for each individual CAD drawing file.

Looking to Fig. 2, the conversion process is initiated by the customer member clicking on member activities icon 60 and selecting "drawing conversion". Looking to Fig. 6, in step 136, host computer 12 sends a drawing conversion form to customer member computer 14, which prompts the member to enter its member ID number and password. Host computer 12 is programmed to verify the accuracy of the member ID number and password. Upon verification, host computer 12 will prompt the customer member to download the drawing conversion software program from server 20 for use locally by customer member on customer member computer 14.

In step 138, customer member will run the conversion software program to create conversion profile which may be used to convert the customer member's CAD drawings. In step 140, the conversion data is stored to a conversion database maintained by the conversion software program. In step 142, customer member will run a batch conversion of all CAD drawings that it intends to submit for a price quotation.

The conversion process is described in more detail in Figs. 7 - 10. Referring to Figs. 7 and 8, the conversion software will generate an interactive graphics conversion form 146. In step 148, customer member opens a representative CAD drawing file in the conversion software program by selecting the file name from file menu 150 and selecting the format of the drawing from format menu 152. The conversion software may be created to work with any number of standard interface formats such as DXF, IGES or XML, and/or popular

proprietary format brands such as Pro-E or Unigraphics. In step 154, the product part described in the drawing file will be displayed on the screen of customer member computer 14. A conversion browser is opened which allows the customer member to view any specific layer, font and color combination in the drawing. These layer, font and color combinations are typically used in CAD drawings as a designation for certain characteristics of that portion of the part graphically displayed, such as the process used to make that portion of the part. In step 156, customer member is prompted to select a specific layer, font and color combination in the drawing. In step 158, once the combination has been highlighted by customer member, windows 160, 162 and 164 are displayed listing the specific layer, font and color combination selected respectively. If a specific layer, font and color combination is used by the customer member in its drawings, but is not used in the representative drawing that has been opened, in step 156, the customer member may instead simply manually select the specific layer, font and color combination from the pull-down menus for windows 160, 162 and 164.

In step 166, the customer member is prompted to enter information into process window 166 indicating what that specific layer, font and color combination means in the customer member's drawings. For example, layer 1, font 2 and color 1 shown in customer member's drawings may always be used to represent a laser process. Thus, customer member will first highlight this layer, font and color combination on the drawings using the browser and then select "laser process" from the pull down menu for window 166 to indicate that this combination stands for laser process in the customer member's drawings. Once this information is entered, the customer member will click on "Save Assignment" button 170 and the assignment will be listed in the current assignments window 172.

In step 174, the customer member is queried as to whether or not all of the different layer, font and color combinations used in its drawings to designate certain manufacturing details have been selected. If the customer member answers "no", it is routed back to step 156 wherein the customer member can highlight another combination shown in the drawing or can manually enter the combination used by customer member in some of its drawings in its windows 160, 162 and 164. In this fashion, the conversion software will be able to identify the combinations in any drawings of the customer member and convert the same to the uniform code of designation used by the network system.

With reference to Figs. 7 and 9, if the customer member answers "yes", in step 174 the software conversion program generates an interactive pre-programmed information form 176 which prompts the customer member to enter information about any text strings used in the

drawings to designate certain manufacturing details of the part. These text strings may be used to indicate the material, grain or part number of the part displayed in the drawing. For example, the customer member may always use the designation "PN" to indicate the part number. Thus, in the drawings, the part number will appear as "PN 5049". Similarly, the drawings may reflect the specific raw material used for production of the part by using the text "RMAT:" In some drawings, the raw material may be listed using specific codes or acronyms known to the customer member such as "ALUM" for aluminum. Other types of pre-programmed information may include the quantity of the part, the grain constraint, common cut, kerf side, text labeling, order number, order due date, and the like.

In step 180, the customer member is prompted to identify each text string used in its drawings and to assign a meaning for that text string by filling in the text and selecting meanings from pull down menus. In this fashion, the conversion software will be able to identify the text strings in any drawings and convert the same to the uniform code of designation used by the network system.

Looking to Figs. 7 and 10, in step 182, the drawing conversion program will generate a tool screen to enable the customer member to identify any shapes or symbols used in its drawings to designate special tooling requirements, such as louvers or electrical knock-outs. In addition, spot weld locations can be specified by a specific shape. The graphical shape will be highlighted by the browser and the customer member will select the specific tool assignment from a tool library stored within the conversion software program. In this fashion, the conversion software will be able to identify these shapes in any drawings of the customer member and convert the same to the uniform code of designation used by the network system.

With reference to Fig. 7, in step 186, the conversion software will review the CAD drawing that has been opened to assure that all layer, font and color combinations, text strings and tool shapes in the drawing have been assigned a meaning. If certain of these designations have not been assigned a meaning (including that the designation should be ignored), the customer is routed back to the applicable steps in order to enter this information. It should be noted that the customer member will likely want to open several representative drawing files in the conversion software to complete this process so as to assure that all the various designations used in its drawings have been identified. It is common for manufacturers to have legacy data generated over time using different systems and various engineers. Multiple conversion profiles may be created and stored to accommodate different engineering styles or different CAD systems.

In step 188, the conversion information provided by the customer member is saved as a conversion profile in a conversion database within the conversion software for use in converting the customer member's drawing files. Once the customer member's conversion profile has been entered, the customer member can convert drawings whenever needed in order to submit an RFQ to the network system. It should be understood that multiple conversion profiles can be created and saved by the customer member for different customer circumstances and environments.

In step 190, the customer member selects one or more CAD drawing files to be converted. In step 192, the conversion software will convert each manufacturing detail denoted in the selected drawing files to the predefined code of designation previously established for that detail as standard for the network. This is accomplished by searching the conversion profile for each manufacturing detail to identify what designation is used by that customer member for the specific detail, searching a pre-defined code of designation database within the conversion software program to ascertain which designation has been assigned to that specific detail, identifying the original designation in the drawing file and converting the original designation to the pre-defined network standard code of designation. The drawing conversion program will complete this process for each designation denoted in the drawing file.

After each drawing is converted, it will be automatically checked for errors such as missed assignments, open tool paths, and any other problems that will lead to an inability to convert the drawing into manufacturing data. If any errors are noted in the file, the information will be logged in an error file and the part is placed in an error directory for review by the customer member. The customer member will then be able to open the error file within the conversion software and perform steps 154-188 to correct the error.

In an alternative embodiment, the customer member may upload the drawing conversion profile as a file for storage on the host computer in customer database. In this alternative embodiment, the customer member will then submit its original drawing files to the network system by transmitting the same to the host computer, and the host computer will then perform the conversion process by referencing that member's drawing conversion profile.

In yet another alternative embodiment, it is anticipated that the conversion program may not be downloaded onto member computer 14, but will instead reside on host computer 12. In this embodiment, the customer member will transmit its conversion information by

interacting with conversion pages, similar to the forms and screen displays shown in Figures 8-10, which information will then be stored by the host computer in customer database.

If the customer member desires to obtain a price quotation for the production of any product or products, the customer member will click on the member activities icon 60 (Fig. 2) and indicate that it wants to submit an RFQ.

Looking to Fig. 6, in step 144, the customer member will upload the converted drawing files for the product(s) it is requesting to be produced and supply additional order information responsive to an RFQ form sent by host computer 12 for display on supplier member computer 18. This form will first prompt the customer member to enter its ID number and password. Upon verification of the ID number and password, the host computer will prompt the customer member to enter order information that is not provided in the drawings. This order information may include the quantity needed, earliest acceptable date of delivery, the deadline for delivery, the destination for delivery, packaging requirements, shipping requirements, and certification requirements for the supplier. The converted drawings and associated ordering information are then uploaded to host computer 12. Host computer 12 will assign an RFQ number and store the drawing files and ordering information in RFQ database under the customer member ID number and RFQ number. Host computer will also send an acknowledgement of the RFQ and the RFQ number to the customer member via e-mail.

Upon entry to the RFQ database, the order management software is prompted to perform the price quotation process. In Fig. 6, step 194, host computer 12 will search supplier member database to locate any acceptable supplier members who have the process machinery requirements needed to fulfill the order. The host computer will then implement the NC/CNC conversion program to automatically create a set of NC/CNC part instructions specific to the process machinery and raw materials of each supplier member. As is known in the art, the NC/CNC part instructions direct the machine as to how the specific geometry and processing requirements for the part are implemented.

The NC/CNC instructions are created in step 194 by retrieving the target machine and controller information, as well as the materials and tooling information, for each acceptable supplier member from supplier member database. The NC/CNC conversion program will then prepare NC/CNC part instructions specific to the type of target machine, controller, raw materials and tooling used by each supplier. In step 196, the NC/CNC instructions created for

each specific supplier member will be stored in RFQ database under the RFQ number and supplier member ID number.

In step 198, the NC/CNC conversion program will then prepare NC/CNC nesting instructions specific to the type of target machine, controller, raw materials and tooling used by each supplier member. As is known in the art, the NC/CNC nesting instructions are developed to efficiently combine a number of parts on one sheet of material for production. The various parts being ordered are positioned on the sheet in a manner that will minimize machine time and raw material remnants. These nesting instructions therefore instruct the most efficient tool path. In step 200, the NC/CNC nesting instructions created for each specific supplier member will be stored in RFQ database 30 under the RFQ number and supplier member ID number.

Conversion of drawings into NC/CNC part and nesting instructions for use by process machinery in the production of products is well known in the art. The NC/CNC software will create these instructions with reference to machine library database 32, which includes information on all of the different target machines including their respective controllers. This information will provide the software with information about the unique characteristics of the specific supplier member's process machine and controller in order to create the NC/CNC instructions.

A variety of different types of software products are currently available in the marketplace which will create the NC/CNC part and nesting instructions for specific types of machines. These software products include NC Expert offered by Optimation, Inc. of Independence Missouri within its line of Plug & Lase, OptiComp, OptiLaser, Optinest, OptiPunch, OptiRout and Optiship products; RadPunch, RadProfile and RadNest offered by Radan Computational Limited of the U.K.; Sigmanest offered by SigmaTEK Corporation out of Cincinnati, Ohio; and SMP by Merry Mechanization, Inc. out of Englewood, Florida.

In step 202, the quotation calculation software will be implemented to retrieve the cost and delivery models for the first acceptable supplier member from the supplier member database 26. In step 204, the quotation calculation software will calculate the price for which the first acceptable supplier member is willing to produce the product(s) and the date by which the product(s) will be delivered. This calculation is performed by inserting the values for the business variables, the values for the delivery variables and the values for the processing variables into the cost and delivery formulae created by that supplier member. The

specific value for each business variable and delivery variable has been provided by the supplier member and can be obtained from the cost and/or delivery model.

The values for the processing variables can be retrieved from (1) the order information supplied by the customer member for that particular order which is stored in RFQ database 30 under the RFQ number, (2) the NC/CNC nesting instructions created for that particular RFQ for that specific supplier member which is stored within the RFQ database 30 under the RFQ number and supplier ID number, (3) the target machine, controller, materials and tooling information for that specific supplier member stored within the supplier member database 28 under the supplier member ID number, and/or (4) library databases 32-40 which provide more complete descriptions, for various machines, materials, tooling, welding, paint and finish processes. Thus, the values for the processing variables are specific to the particular order and the specific supplier member.

For example, with reference to Fig. 4, in calculating the material cost, the values for the part length and part width will be obtained from the NC/CNC instructions developed for each part ordered. The values for material thickness and density will be obtained by first looking to the NC/CNC instructions created for the part to determine the material used to produce the part, next ascertaining the specific type or form of that material used by the supplier member by referencing to supplier member database 28, and lastly retrieving the thickness and density values for that particular type or form of material from material library database 34.

In step 206, the quotation developed for the first supplier member will be stored in the price quotation database 42 under the RFQ number and supplier member number. In step 208, the price quotation software will check to determine if there are any other acceptable supplier members. If there are additional acceptable supplier members, steps 202-206 will be performed for each additional supplier member.

If there are no additional acceptable supplier members, in step 210, host computer 12 will generate a notification via e-mail to the customer member alerting the customer member that the quotations for its RFQ have been calculated. In step 212, the customer member will log on to the host Web site home page and click on icon link 60 (Fig. 2) for member activities. The customer member will then indicate that it desires to review a quotation and generate an order. Host computer will send a quotation review form to the customer member computer 14 prompting the customer member to enter its member ID number, password and the RFQ number. Upon verification of the ID and password, in step 214, host computer 12 will

compile a listing of all the quotations created and stored under the RFQ number within price quotation database 42 and transmit the same to the customer member for review. As shown in Fig. 11, the quotation compilation will preferably be supplied to the customer member as an interactive form 216 which allows the customer member in step 218 to filter out certain quotations by setting various criteria, such as estimated price amount, delivery date, shipping distance, certification status and/or customer satisfaction rating for the supplier member.

In step 220, the customer member may select a supplier member for production of the products based upon the quotation and submit the selection to host computer 12. In step 222, the host computer will assign an order number to the order and acknowledge the selection via an e-mail or other transmission to the customer member. In step 224, host computer 12 will issue an order for the product(s) to the selected supplier member. This initial order will be transmitted to the supplier member via an e-mail or other transmission. The order will provide key order and delivery date requirements including number of products, processing machinery needed to produce the products, raw material and tools needed to produce the products, delivery destination and latest acceptable delivery date. In step 226, the supplier member will indicate whether it accepts the order via an e-mail or other communication to host computer. If the supplier member rejects the order, the host computer will send a notice of the rejection to the customer member via e-mail. If the supplier member accepts the order, in step 230, the host computer will send notice of acceptance which in step 231 is received by the customer member.

In step 232, host computer 12 will retrieve the NC/CNC part and nesting programs developed for that particular supplier member's specific process machinery relative to the order from RFQ database 30 and transmit the program files to the supplier member. Optionally, the host computer may create a new nesting program that combines all of the products currently ordered from the supplier member by all customer members. This would be accomplished by first retrieving a listing of the RFQ numbers for all the orders accepted by the supplier member that have not been completed from order database 40. The host computer would then retrieve the NC/CNC part programs for all those orders from RFQ database 30 and prepare new NC/CNC nesting instructions incorporating all of the parts. In this fashion, a more efficient nest can be created so as to further reduce machine time and material costs. The order and NC/CNC files transmitted to supplier member will be stored in supplier download database 46 under the supplier member ID number, RFQ order and order number.

In step 234, the supplier member will receive the NC/CNC part and nesting programs for use in production of the parts. In step 236, the supplier member automatically loads the NC/CNC instructions into its controller for the process machinery in order to begin production of the ordered product(s). The supplier member will regularly provide the host computer 12 with status reports indicating the status of the production effort. In a preferred embodiment, the host computer will regularly poll tracking software used in the supplier member's facilities for tracking the progress of orders, without the need for manual entry by the supplier member. In step 238, these status reports are received by host computer 12 and stored in job status database 50. In step 240, the status reports will be transmitted via e-mail to the customer.

Alternatively, in step 242, the customer member may check the status of its orders by clicking on member services icon 58 and selecting "view project status". Host computer 12 will send a form for display on customer member computer 14 which prompts the customer member to enter its member ID number and password. Upon verification of the member ID number and password, host computer will retrieve a listing of all outstanding orders from the order database 44 and then retrieve the status reports for each order from job status database 50.

Upon completion of the order, in step 244, supplier member will provide notice of the completion to host computer 12. This notice will be stored in job status database 50 and in order database 44. The status of the order can then be conveyed to the customer member via steps 240 and/or 242 described above. In step 246, the supplier member ships the ordered product(s) to the customer member in accordance with the order information. In step 248, the customer member acknowledges receipt of the ordered parts by sending notice of the same to host computer 12. Alternatively, supplier member will send notice and proof of delivery to host computer. Upon notice of receipt, in step 250, host computer will implement the electronic payment software. This software will retrieve the price amount of the order from price quotation database under the RFQ number, the customer payment information from customer member database 26 and the supplier payment information from supplier member database 28.

In step 252, the electronic payment software will send the electronic payment to the supplier member's bank account, and in step 254 will debit the bank account of the customer member. In step 256, a new RFQ and/or order may be initiated by the customer member.

Looking back to Fig. 1, the member can receive additional member services by clicking on member services icon link 58. For example, a supplier member can update or

otherwise modify its cost profile or delivery profile data contained within supplier member database 28 as previously described. A supplier or customer member can view any current financial activities including membership fees payments and payments for product orders contained with payment transactions database 52. In addition, a member can view a status report respecting the current status of any orders that have been placed by or with the member contained with job status database 50.

In addition, members may obtain member assistance by clicking on icon link 64 on the host Web site home page (Fig. 2). This additional assistance may include purchasing raw materials, obtaining engineering services, obtaining manufacturing or assembly services, RFQ's for machine tools, live on-line assistance respecting the use of the network, and customer service.

From the foregoing it will be seen that this invention is one well adapted to attain all ends and objectives herein-above set forth, together with the other advantages which are obvious and which are inherent to the system and method.

Since many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matters herein set forth or shown in the accompanying drawings, are to be interpreted as illustrative, and not in a limiting sense. For example, in the preferred embodiment described in this detailed description, the network interface for communicating with member computers comprises a Web site. However, it should be understood that other means of communication could also be used for purposes of this invention including via modems, voice mail interfaces, BBS or electronic mail.

While specific embodiments have been shown and discussed, various modifications may of course be made, and the invention is not limited to the specific forms or arrangement of parts and steps described herein, except insofar as such limitations are included in the following claims. Further, it will be understood that certain features and sub-combinations are of utility and may be employed without reference to other features and sub-combinations. This is contemplated by and is within the scope of the claims.

CLAIMS

I claim:

1. An automated method for conveying the manufacturing details of a product to a supplier for production of the product, said method comprising the steps of:

converting a detailed description of a product to be produced to a uniform description, wherein each manufacturing detail of the product is denoted in the uniform description using a pre-defined standard code of designation;

creating instructions in machine readable form from the uniform description, wherein said instructions can be implemented by a supplier's process machinery for production of the product; and

communicating said instructions to the supplier over a computer network.

2. An automated method in accordance with claim 1, wherein said detailed description of the product comprises at least one pre-existing CAD drawing.

3. An automated method in accordance with claim 2, wherein said converting step comprises converting each designation used in the pre-existing CAD drawing to denote a specific manufacturing detail to a pre-defined standard code of designation for the manufacturing detail denoted.

4. An automated method in accordance with claim 1, wherein said communicating step comprises transmitting said instructions directly to the supplier member's process machinery controller(s).

5. A computer for creating a uniform description of a product, said computer programmed to perform the steps comprising:

loading into a computer at least one pre-existing CAD drawing of a product;

prompting a user to input conversion information into the computer to indicate what specific designation is used in the pre-existing CAD drawing for each manufacturing detail denoted in the drawing; and

converting each designation in the pre-existing CAD drawing to a pre-defined standard code of designation for the manufacturing detail denoted.

6. A computer in accordance with claim 5, wherein:

said prompting step comprises prompting the user to input conversion information that uniformly applies to a plurality of pre-existing drawings; and

said converting step comprises converting each of the designations used uniformly in the plurality of pre-existing drawings to the pre-defined standard designations via computerized batch processing.

7. An automated method for conveying the manufacturing details of a product to a supplier for production of the product, said method comprising the steps of:

collecting supplier information from one or more supplier members regarding the specific process machinery used by each supplier in the production of products;

obtaining from a purchaser, via a computer network, an order for production of a product by a specific supplier member, wherein said order comprises a detailed description of the product;

converting said detailed description of the product to instructions in machine readable form that can be implemented by the specific supplier member's process machinery for production of the product; and

communicating said instructions to the specific supplier member via a computer network.

8. An automated method in accordance with claim 7, wherein said detailed description of the product comprises at least one CAD drawing.

9. An automated method in accordance with claim 7, wherein said communicating step comprises transmitting said instructions to the specific supplier member's process machinery controller(s) via a DNC link from supplier member's computer.

10. An automated method for obtaining price quotations for the production of a product from one or more supplier members, said method comprising the steps of:

collecting supplier member information from at least one supplier member regarding the supplier member's manufacturing process capabilities and pricing formulae;

obtaining from a customer the manufacturing details for the product desired to be produced with sufficient specificity to enable production of the product;

searching the collected information to determine which supplier members have the process capabilities for production of the product;

calculating the price for which each supplier member can produce the product based upon the pricing formulae provided by the supplier member; and

conveying the calculated pricing for each supplier member to the customer.

11. An automated method in accordance with claim 10, wherein said collecting step additionally comprises collecting information from at least one supplier member regarding the supplier member's delivery formulae.

12. An automated method in accordance with claim 10, wherein said collecting step additionally comprises collecting information from at least one supplier member regarding the supplier member's certification(s).

13. An automated method in accordance with claim 10, wherein said method includes the additional steps of:

receiving an order from the customer for a specific supplier member to produce the product; and

conveying the order to the specific supplier member.

14. An automated method in accordance with claim 13, wherein said method includes the additional step of conveying the manufacturing details for production of the product to the supplier member.

15. An automated method in accordance with claim 14, wherein said conveying step comprises conveying the manufacturing details to the supplier member in machine readable form specific to the supplier member's process machinery.

16. A network system for obtaining pricing quotations for the production of a product from one or more supplier members, said network system comprising:

at least one customer computer connected via a computer network to a host computer, said customer computer being programmed to:

transmit a drawing which describes a product to be produced to the host computer;

at least one host computer connected to a supplier member database, wherein said supplier member database stores process capability and pricing formulae for one or more supplier members, and wherein said host computer is programmed to:

receive the drawing;

check the drawing to determine the process capability requirements needed for production of the product;

search the supplier member database to locate all of the qualified supplier members who have the requisite process capabilities; and

calculate the price for which each supplier member can produce the product based upon the pricing formulae for each qualified supplier member in the supplier member database.

17. A network system in accordance with claim 16, wherein said supplier member database additionally includes information selected from the group consisting of delivery formulae, available capacity information and certifications of the supplier members;

18. A network system in accordance with claim 17, wherein said host computer is programmed to enable each supplier member to access and modify that supplier member's information stored within the supplier member database.

19. A network system in accordance with claim 17, wherein said host computer is programmed to calculate the anticipated delivery date on which each supplier member can deliver the product based upon information selected from the group consisting of delivery formulae and current available capacity information for each supplier member.

20. A network system in accordance with claim 16, wherein said host computer is programmed to send the calculated pricing for each supplier member to the customer.

21. A network system in accordance with claim 20, wherein said host computer is programmed to:

receive an order from the customer for production of the product by a specific supplier member; and

transmit the order to the supplier member.

22. A network system in accordance with claim 21, wherein said host computer is programmed to send a detailed description of the product to the specific supplier member for production of the product.

23. A network system in accordance with claims 16 and 21, wherein said step of calculating the pricing for which each supplier member can produce the product comprises the steps of:

converting the drawing to the NC/CNC instructions applicable to the specific process machinery controller(s) of that member supplier;

deriving detailed processing figures from the NC/CNC instructions;

inputting the detailed processing figures into the pricing formulae; and

calculating the price quotation.

24. A network system in accordance with claim 23, wherein said host computer is programmed to transmit the NC/CNC instructions to the supplier member.

25. A network system in accordance with claim 16, wherein said system additionally comprises a means for providing engineering services to customers to assist the customer in preparing drawings of the product.

26. A network system in accordance with claim 21, wherein said system additionally comprises a means for enabling direct electronic payment to the member supplier upon delivery or acceptance of the product so as to eliminate the need for invoicing and payment processing.

27. A network system in accordance with claim 20, wherein said system additionally comprises a means for enabling the customer to obtain general information on any of the supplier members before making an ordering decision.

28. A network system in accordance with claim 27, wherein said system additionally includes a means for collecting customer satisfaction data respecting specific supplier members and providing such data to customers.

29. A network system in accordance with claim 20, wherein said system additionally includes a means for order tracking to provide customers with the status of their order.

30. A network system in accordance with claim 16, wherein said computer network is a private intranet network.

31. A network system for communicating the manufacturing details of a product to a supplier for production of the product, said network system comprising:

at least one customer computer connected via a computer network to a host computer, said customer computer being programmed to:

transmit an order for the production of a product by a specific supplier member to a host computer, wherein said order includes a detailed description of the product;

at least one host computer connected to a supplier member database, wherein said supplier member database stores data respecting the specific process machinery and controller(s) used by one or more supplier members in the production of product, and wherein said host computer is programmed to:

receive the order;

search the supplier member database to locate information about the process machinery used by the specific supplier member in the production of product;

create instructions in machine readable form that can be implemented by the specific supplier member's process machinery; and

transmitting said instructions to the specific supplier member for production of the product.

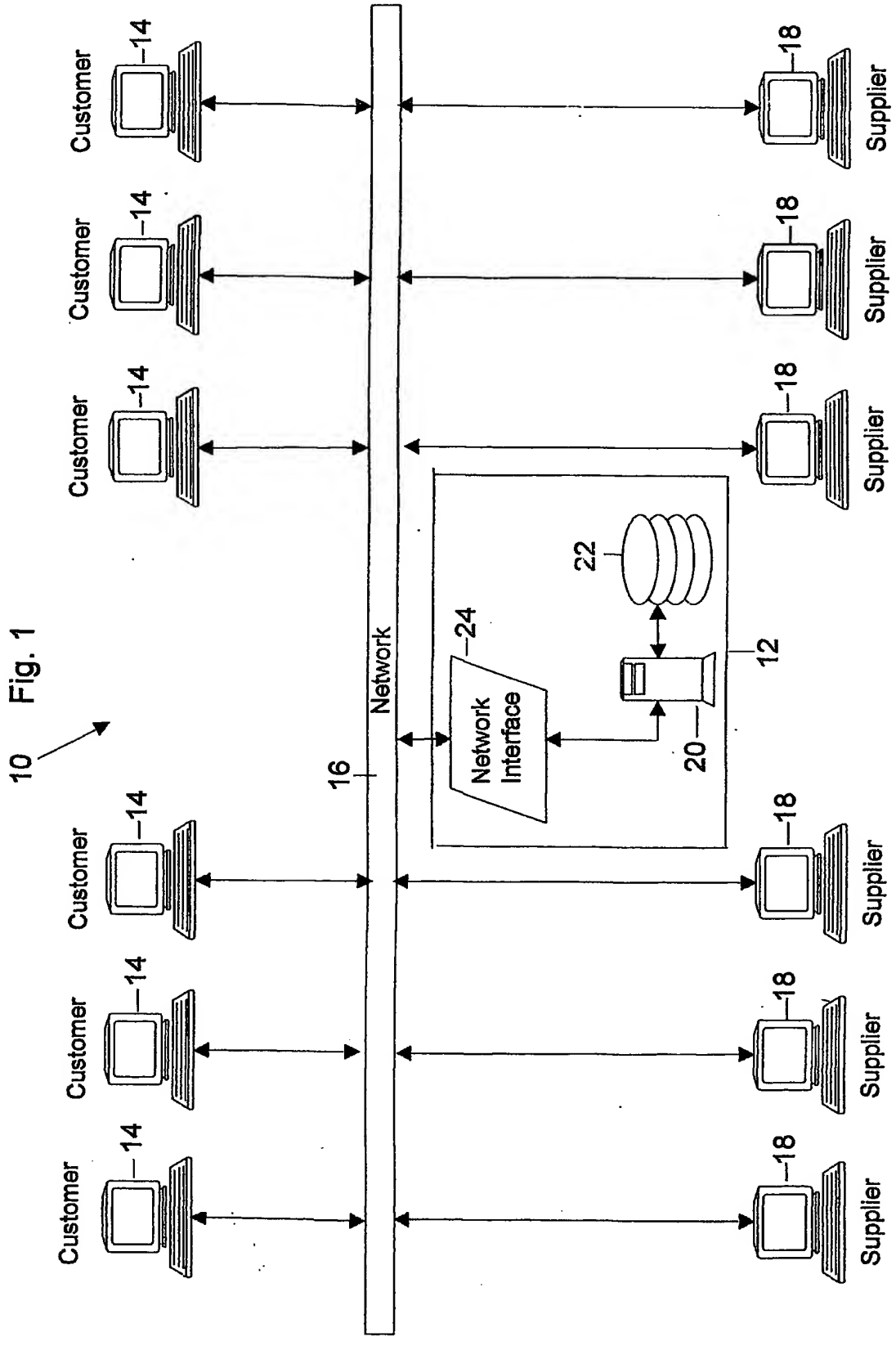

10
Network
16
Customer
14
Supplier
18
12
20
22
24
Network Interface

Fig. 1

Fig. 2

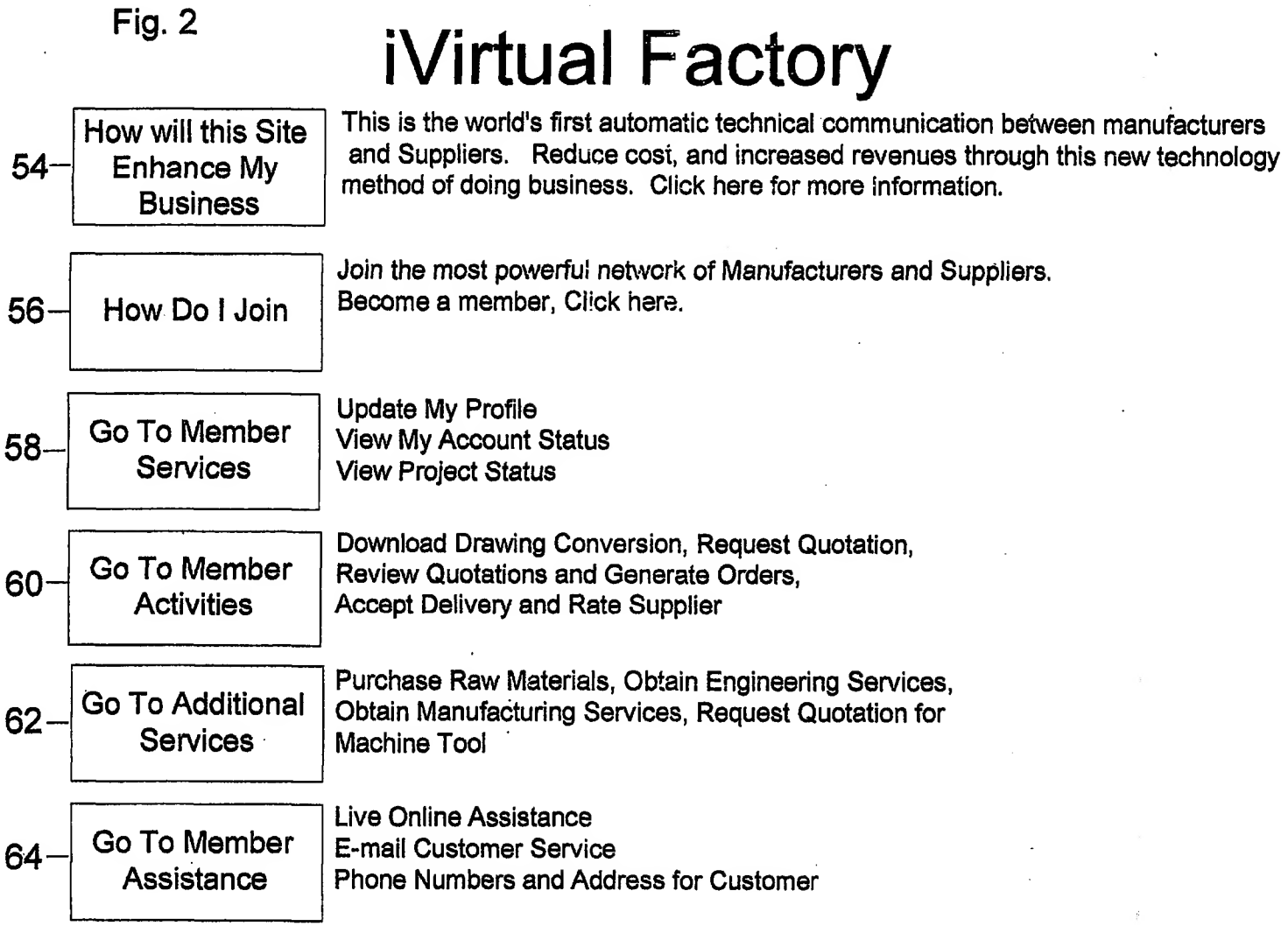

iVirtual Factory
54
How will this Site Enhance My Business
This is the world's first automatic technical communication between manufacturers and Suppliers. Reduce cost, and increased revenues through this new technology method of doing business. Click here for more information.
56
How Do I Join
Join the most powerful network of Manufacturers and Suppliers. Become a member, Click here.
58
Go To Member Services
Update My Profile
View My Account Status
View Project Status
60
Go To Member Activities
Download Drawing Conversion, Request Quotation,
Review Quotations and Generate Orders,
Accept Delivery and Rate Supplier
62
Go To Additional Services
Purchase Raw Materials, Obtain Engineering Services, Obtain Manufacturing Services, Request Quotation for Machine Tool
64
Go To Member Assistance
Live Online Assistance
E-mail Customer Service
Phone Numbers and Address for Customer

Fig. 3A

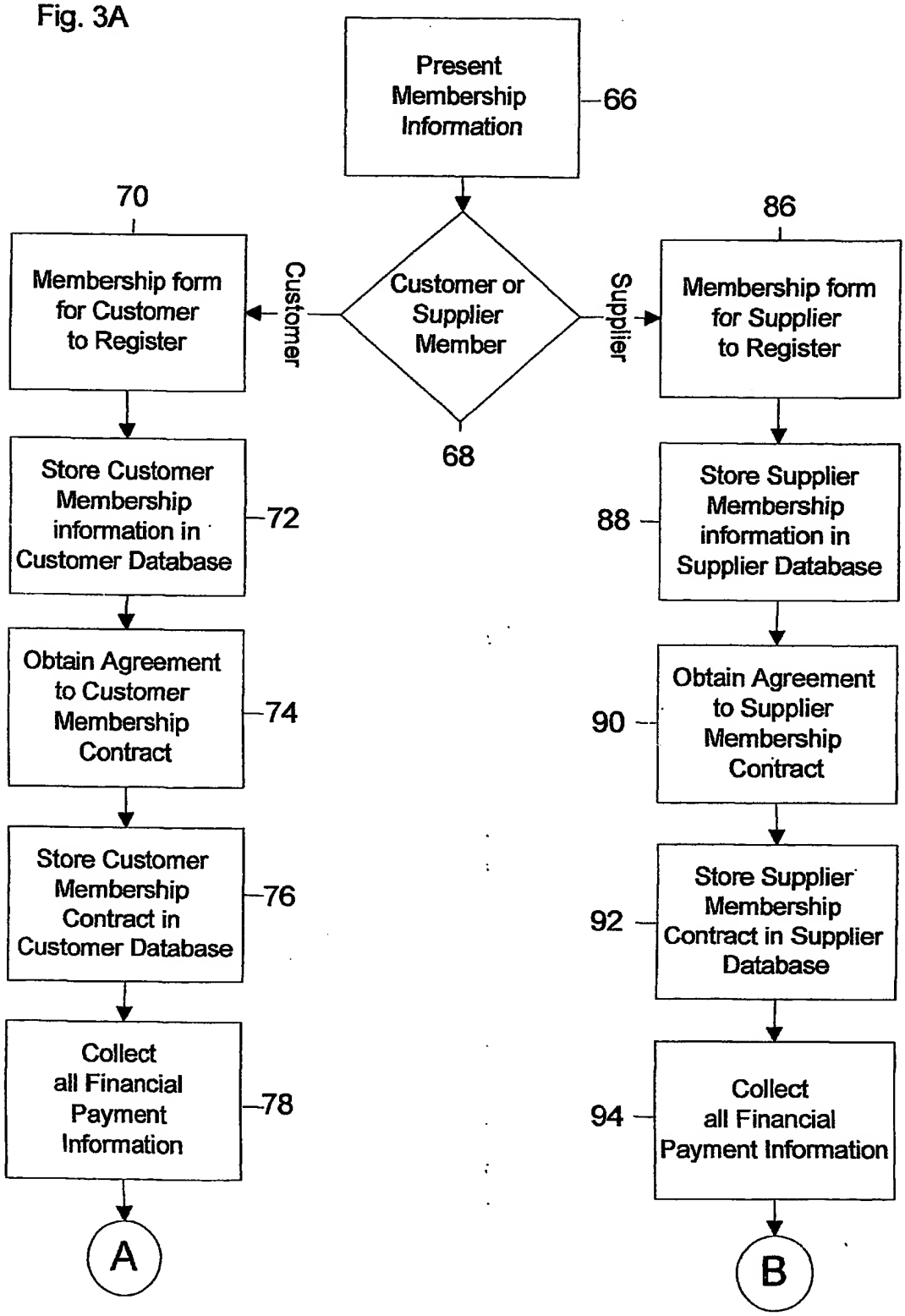

Present Membership Information
66
Customer or Supplier Member
68
Customer
Supplier
70
Membership form for Customer to Register
Store Customer Membership information in Customer Database
72
Obtain Agreement to Customer Membership Contract
74
Store Customer Membership Contract in Customer Database
76
Collect all Financial Payment Information
78
A
86
Membership form for Supplier to Register
88
Store Supplier Membership information in Supplier Database
90
Obtain Agreement to Supplier Membership Contract
92
Store Supplier Membership Contract in Supplier Database
94
Collect all Financial Payment Information
B

Fig. 3B

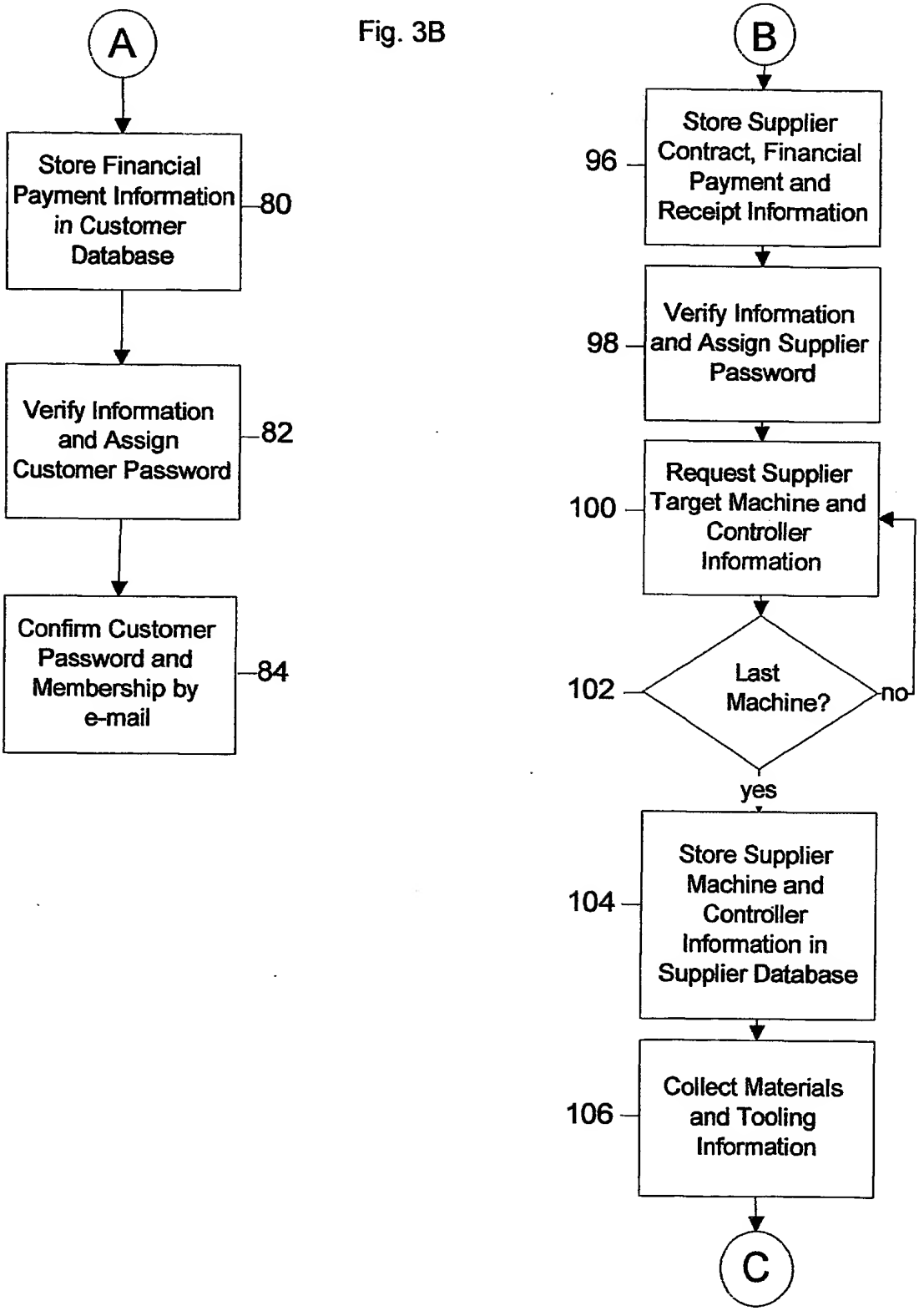

A
Store Financial Payment Information in Customer Database
80
Verify Information and Assign Customer Password
82
Confirm Customer Password and Membership by e-mail
84
B
96
Store Supplier Contract, Financial Payment and Receipt Information
98
Verify Information and Assign Supplier Password
100
Request Supplier Target Machine and Controller Information
102
Last Machine?
no
yes
104
Store Supplier Machine and Controller Information in Supplier Database
106
Collect Materials and Tooling Information
C

Fig. 3C

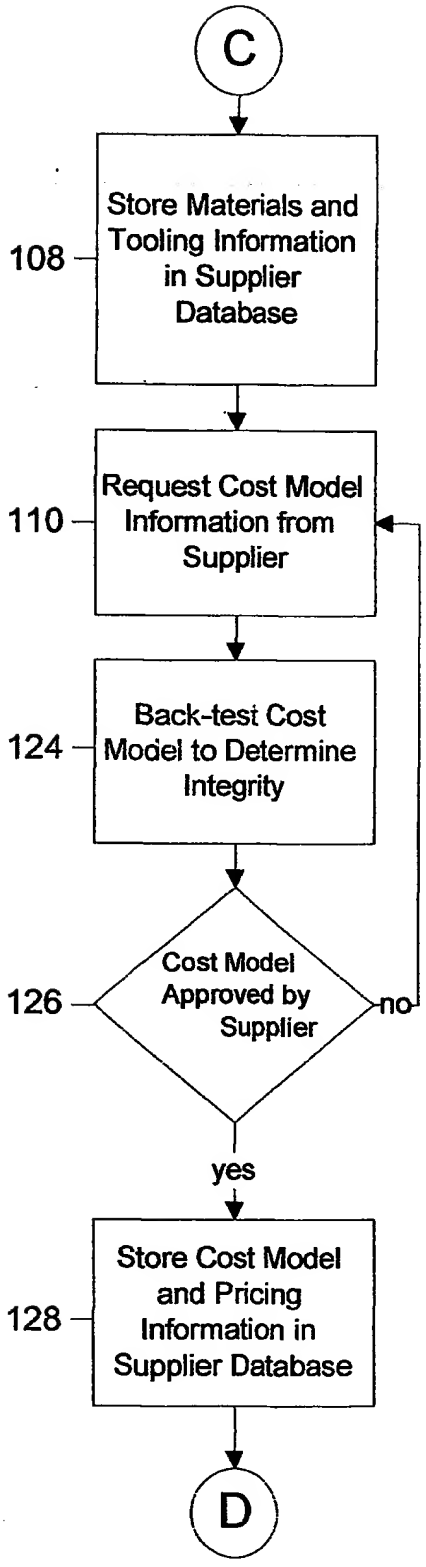
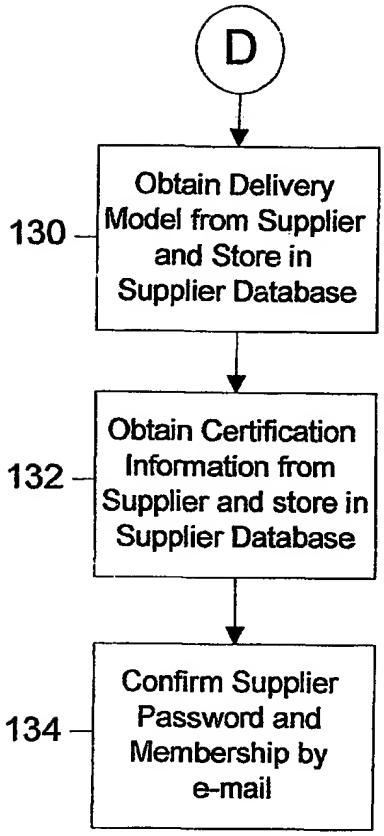

C
Store Materials and Tooling Information in Supplier Database
108
Request Cost Model Information from Supplier
110
Back-test Cost Model to Determine Integrity
124
Cost Model Approved by Supplier
126
no
yes
Store Cost Model and Pricing Information in Supplier Database
128
D

Fig. 3D


D
130
Obtain Delivery Model from Supplier and Store in Supplier Database
132
Obtain Certification Information from Supplier and store in Supplier Database
134
Confirm Supplier Password and Membership by e-mail

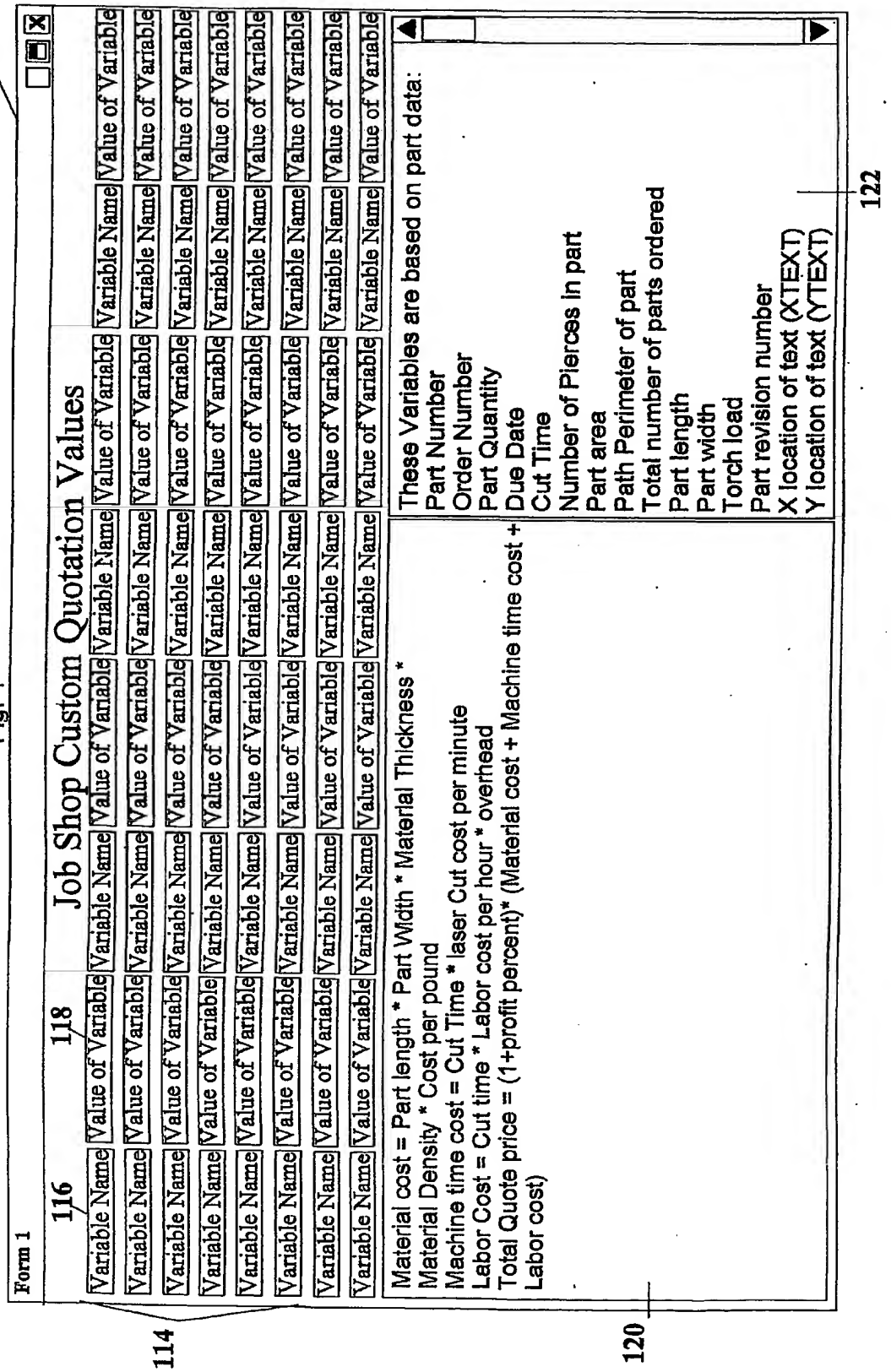

Form 1
112
116
118
Job Shop Custom Quotation Values
Variable Name
Value of Variable
114
Material cost = Part length * Part Width * Material Thickness *
Material Density * Cost per pound
Machine time cost = Cut Time * laser Cut cost per minute
Labor Cost = Cut time * Labor cost per hour * overhead
Total Quote price = (1+profit percent)* (Material cost + Machine time cost +
Labor cost)
120
These Variables are based on part data:
Part Number
Order Number
Part Quantity
Due Date
Cut Time
Number of Pierces in part
Part area
Path Perimeter of part
Total number of parts ordered
Part length
Part width
Torch load
Part revision number
X location of text (XTEXT)
Y location of text (YTEXT)
122

Fig. 4

Fig. 5

These variables are based on the part data:

Part number, Order number, Part quantity, Due date, Cut time, Number of Pierces per part, Part area, Path perimeter of part, Total numbers of parts ordered, Part length, Part Width, Torch load, Part revision number, X location of text (XTEXT), Y location of text (YTEXT).

These variables are based on the material:

Raw material name, Material length, Material width, Material thickness, Material efficiency of the nest – actual and/or rectangular, Pierce time for the current process, Cutting speed, Material cost per pound, Material density, Number of plates left, Material globals (if applicable), Original material length, Original material width, Extended material length (1-10), Extended material width (1-10), Extended material count, Material trims on all four sides, Minimum part spacing.

These variables are based on the nest:

Name of the nest, Single or double plate nesting, Number of unloads, Number of parts in the active file, Nest process, Number of inserted parts on the nest, System date, Remnant name used to create nest, Nest system date, Nest system day, Nest system month, Nest system year, New remnant created from nest.

These variables are based on the machine:

Machine name, Machine process type, Machine rapid speed

These variables are based on the torch load of the nest:

Number of copies of current part, Sequence number of current part, Pierce time of current part, Path length of current part, Area of current part, Torch spacing of current part.

These variables are based on tool information:

Number of tools in tool file, Tool sequence number, Tool name, Die name, Stripper name, Tool orientation, Tool validity (Y or N), Tool type, Tool storage location, Tool priority, Tool hit count, Tool hit count maximum, Tool hit count percentage, Multi-tool position, Tool shape, X dimension of tool, Y dimension of tool, Tool class, Tool hit summary, Tool index-ability (Y or N), Die clearance.

These variables are based on remnants:

Remnant name, Remnant area, Remnant length, Remnant width, Number of steps in the remnant, Remnant step width (1-9), Remnant step length (1-9).

These variables are based on machine time calculations:

Machine processing time, Machine travel time, Machine contour time, Machine cycle time, Machine tool change time, Machine punch nibble time, Machine reposition time, Machine setup time, Machine overhead time.

Fig. 6A

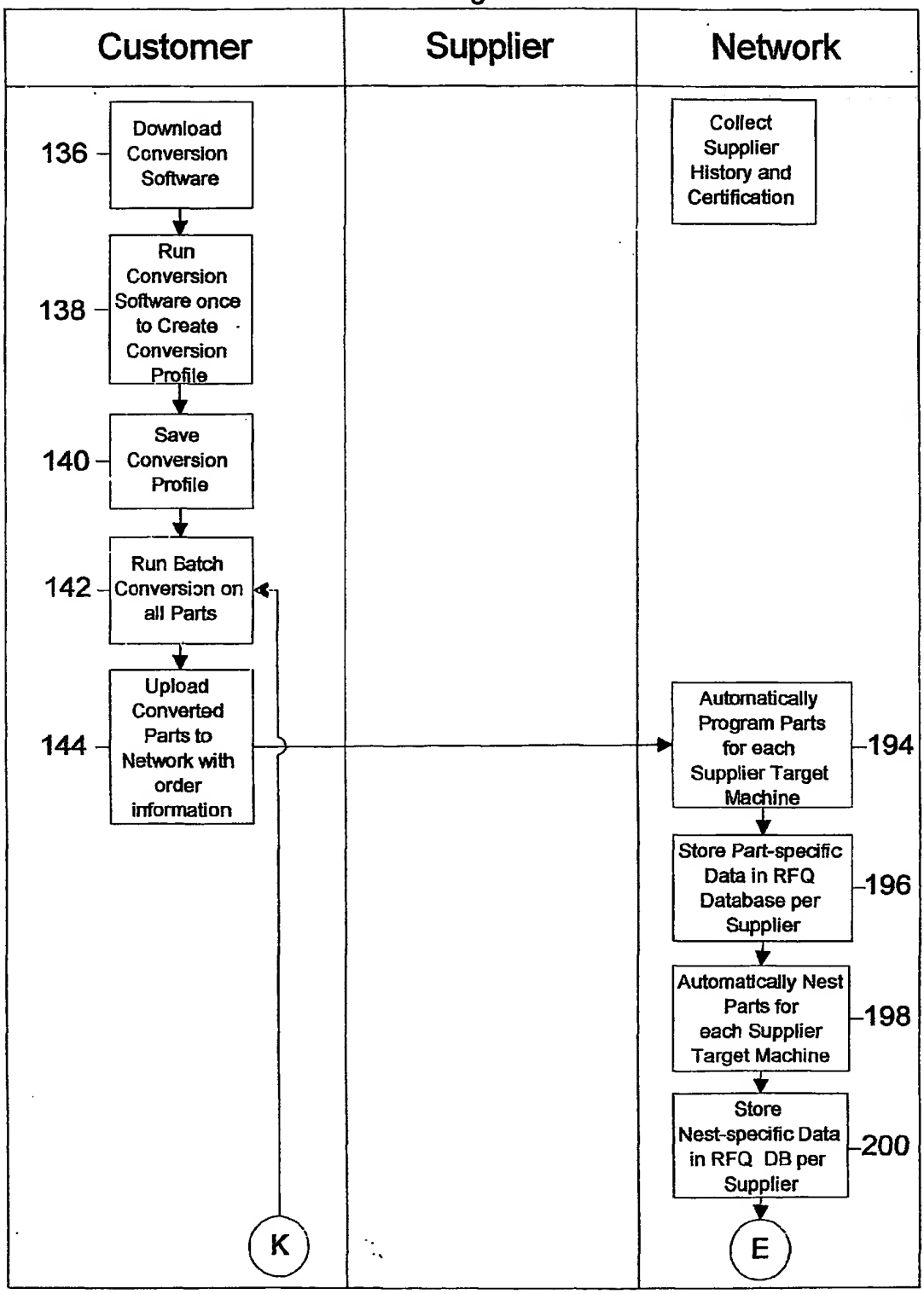

Customer
Supplier
Network
136
Download Conversion Software
138
Run Conversion Software once to Create Conversion Profile
140
Save Conversion Profile
142
Run Batch Conversion on all Parts
144
Upload Converted Parts to Network with order information
K
Collect Supplier History and Certification
Automatically Program Parts for each Supplier Target Machine
194
Store Part-specific Data in RFQ Database per Supplier
196
Automatically Nest Parts for each Supplier Target Machine
198
Store Nest-specific Data in RFQ DB per Supplier
200
E

Fig. 6B

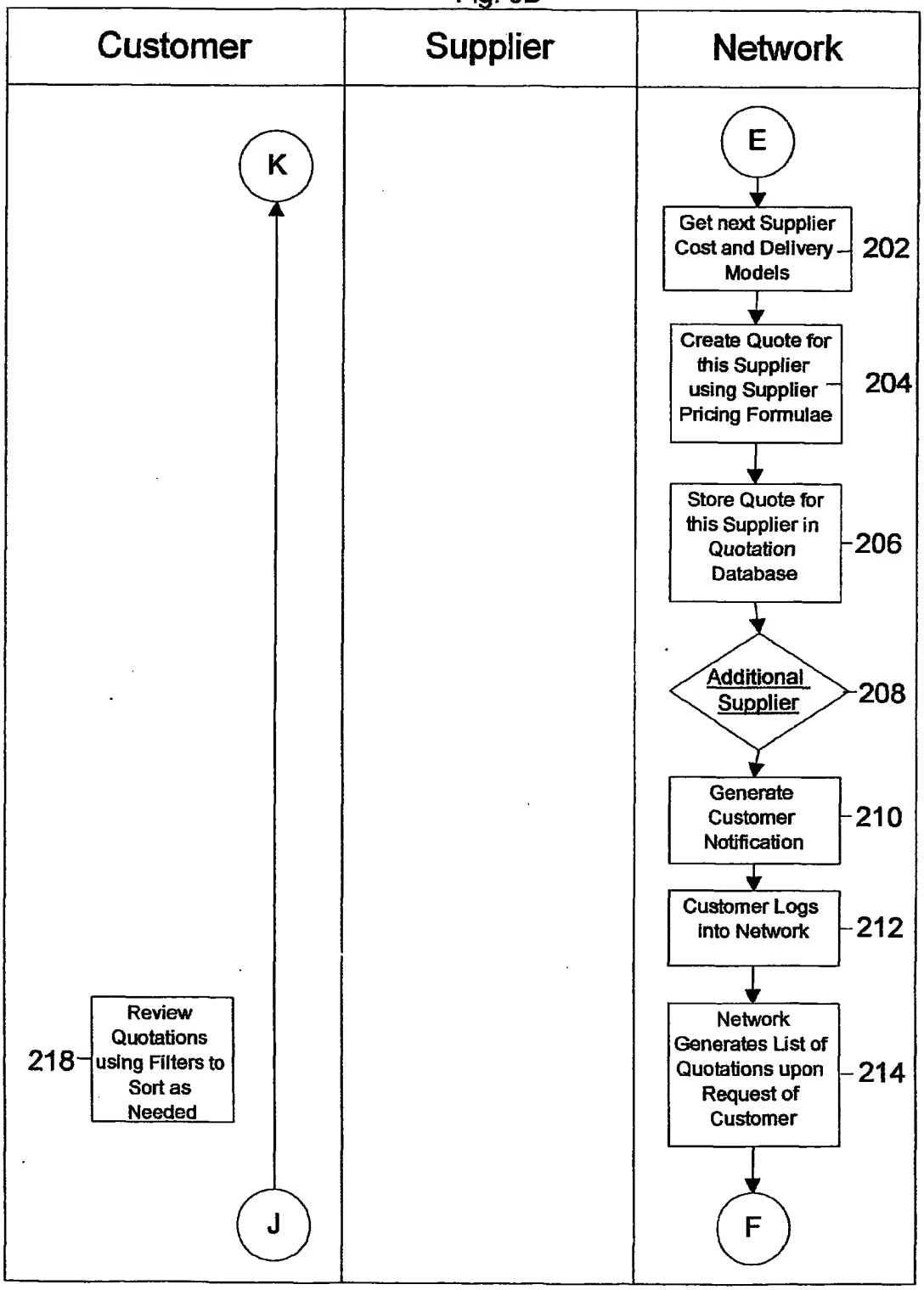

Customer
Supplier
Network
E
Get next Supplier Cost and Delivery Models
202
Create Quote for this Supplier using Supplier Pricing Formulae
204
Store Quote for this Supplier in Quotation Database
206
Additional Supplier
208
Generate Customer Notification
210
Customer Logs into Network
212
Network Generates List of Quotations upon Request of Customer
214
F
K
J
218
Review Quotations using Filters to Sort as Needed

Fig. 6C

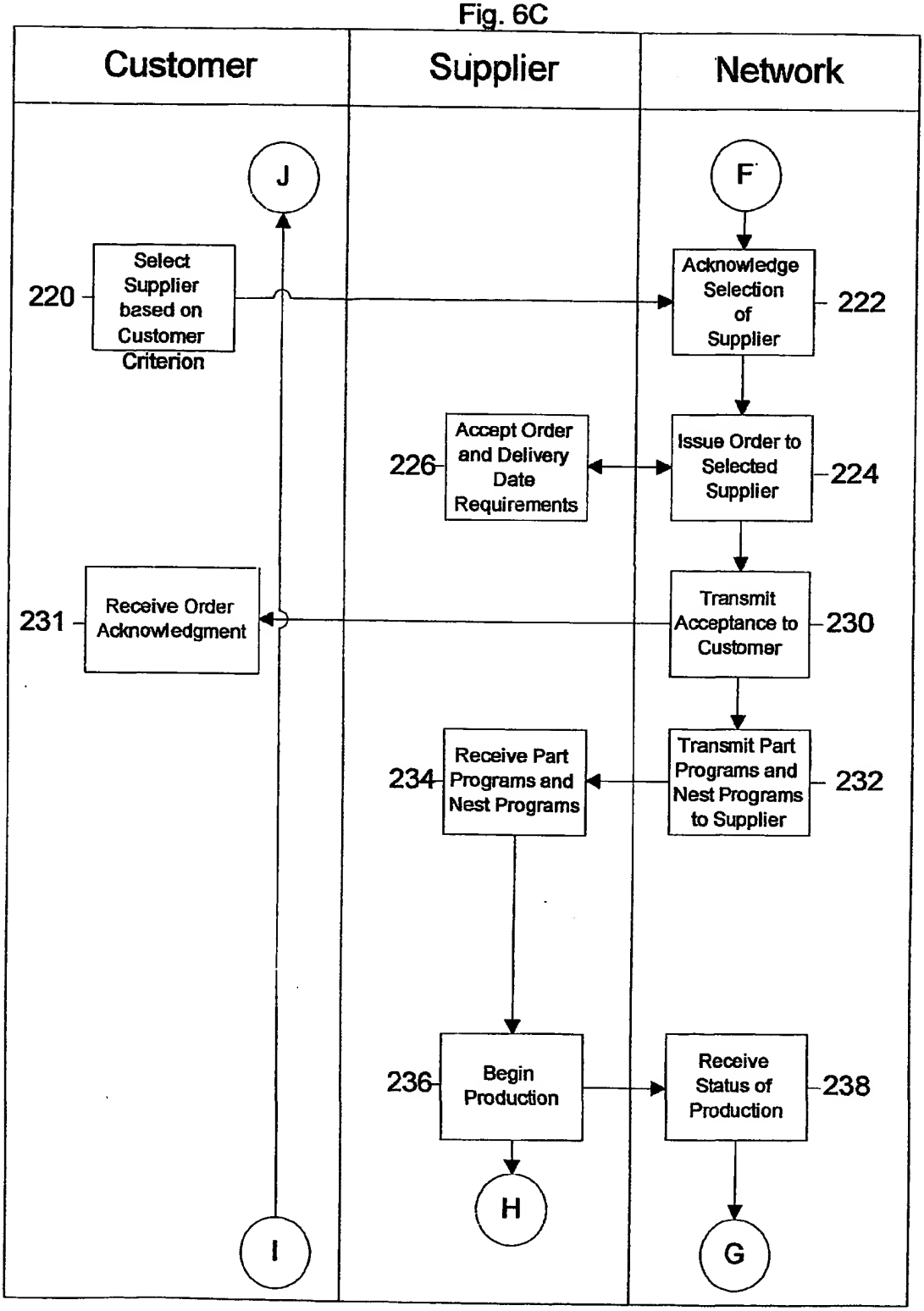
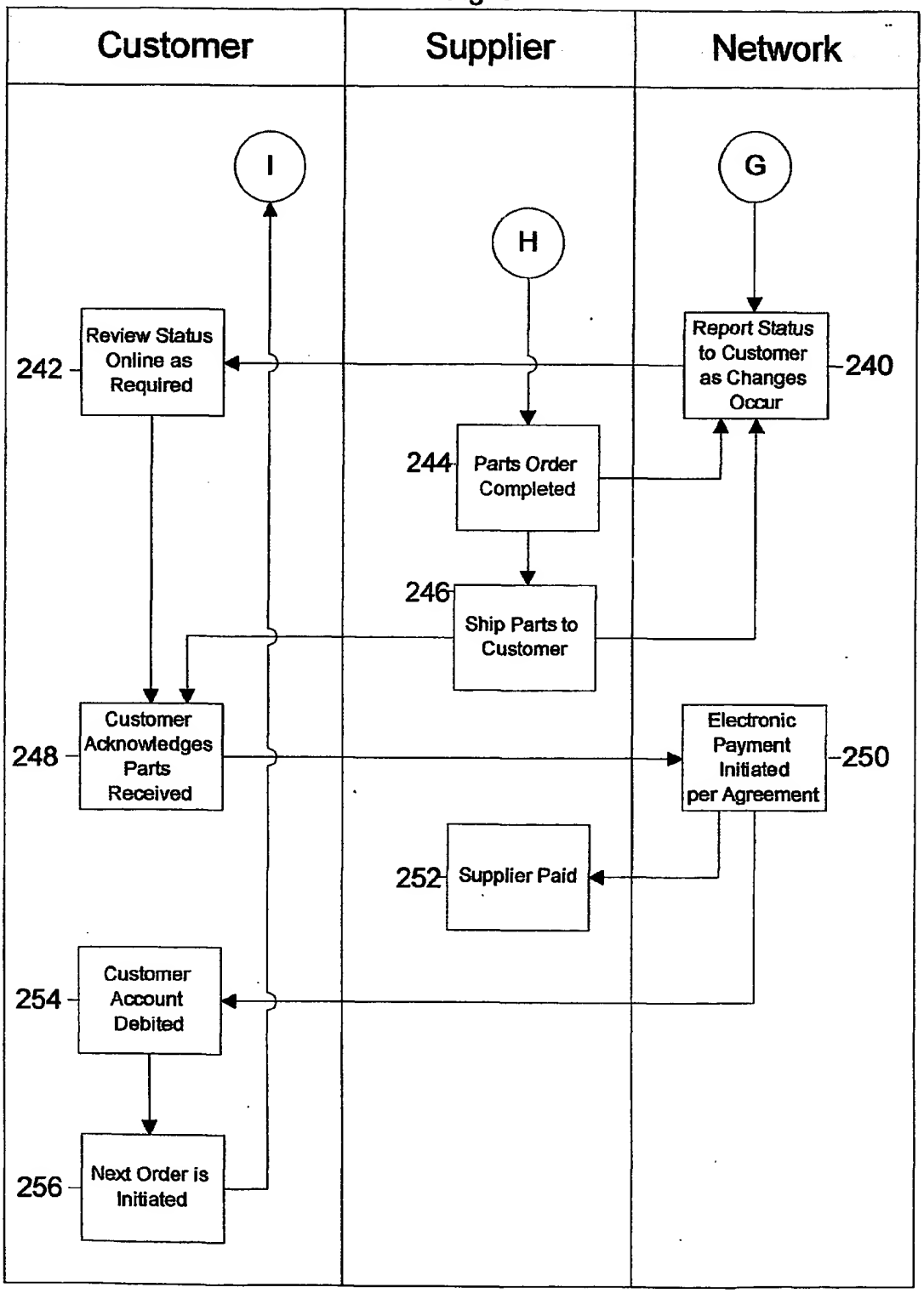

Customer
Supplier
Network
J
F
220
Select Supplier based on Customer Criterion
Acknowledge Selection of Supplier
222
226
Accept Order and Delivery Date Requirements
Issue Order to Selected Supplier
224
231
Receive Order Acknowledgment
Transmit Acceptance to Customer
230
234
Receive Part Programs and Nest Programs
Transmit Part Programs and Nest Programs to Supplier
232
236
Begin Production
Receive Status of Production
238
H
I
G

Fig. 6D


Customer
Supplier
Network
I
H
G
Review Status Online as Required
242
Report Status to Customer as Changes Occur
240
244
Parts Order Completed
246
Ship Parts to Customer
Customer Acknowledges Parts Received
248
Electronic Payment Initiated per Agreement
250
252
Supplier Paid
Customer Account Debited
254
Next Order is Initiated
256

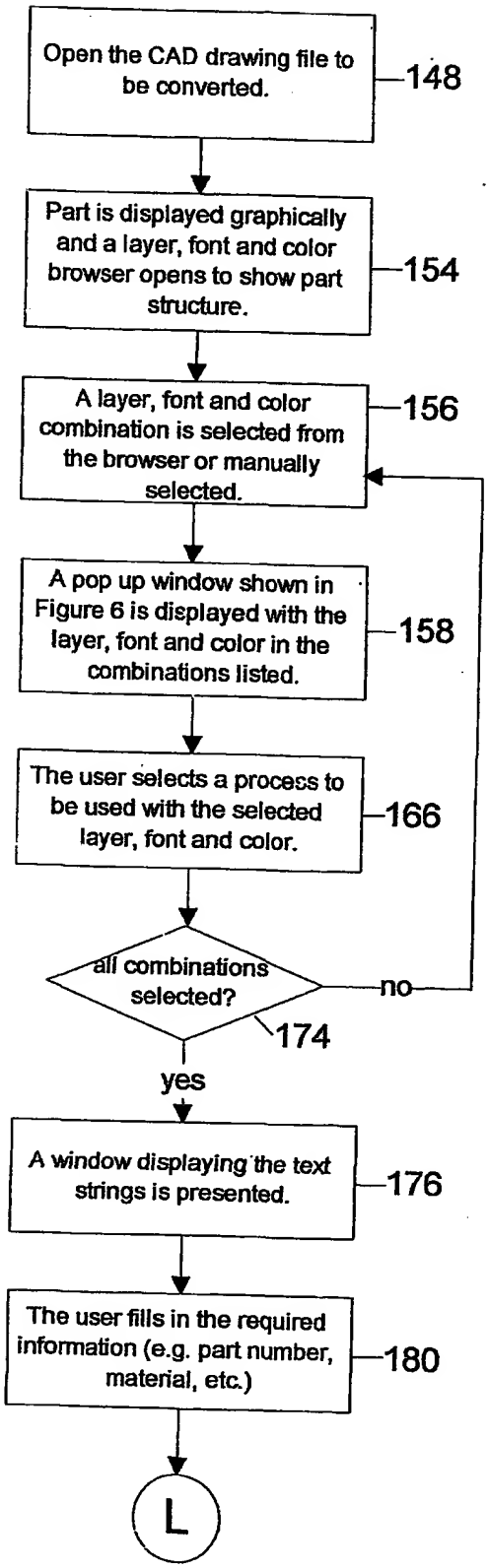

Open the CAD drawing file to be converted.
148
Part is displayed graphically and a layer, font and color browser opens to show part structure.
154
A layer, font and color combination is selected from the browser or manually selected.
156
A pop up window shown in Figure 6 is displayed with the layer, font and color in the combinations listed.
158
The user selects a process to be used with the selected layer, font and color.
166
all combinations selected?
174
no
yes
A window displaying the text strings is presented.
176
The user fills in the required information (e.g. part number, material, etc.)
180
L

Fig. 7A

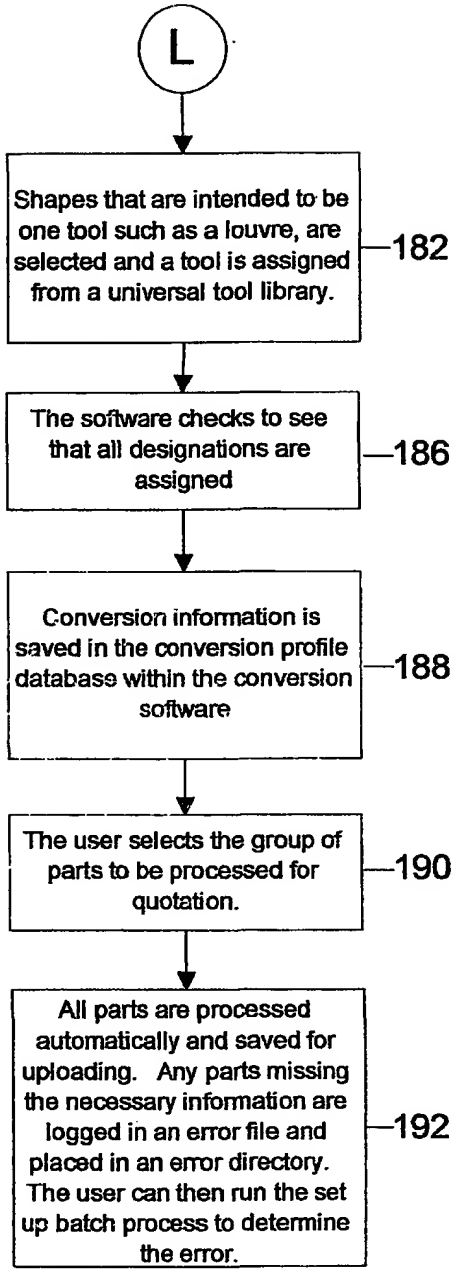
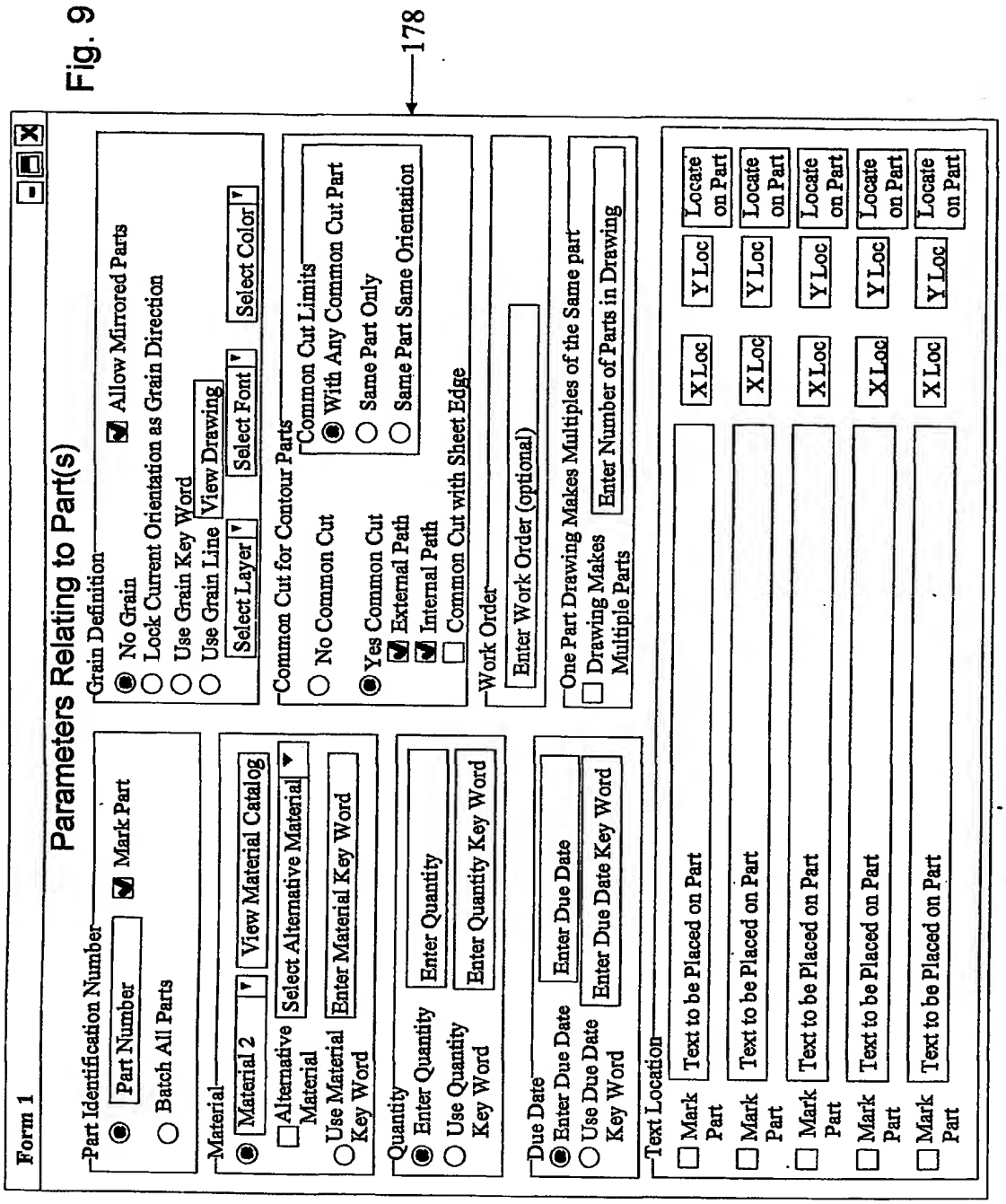

L
Shapes that are intended to be one tool such as a louvre, are selected and a tool is assigned from a universal tool library.
182
The software checks to see that all designations are assigned
186
Conversion information is saved in the conversion profile database within the conversion software
188
The user selects the group of parts to be processed for quotation.
190
All parts are processed automatically and saved for uploading. Any parts missing the necessary information are logged in an error file and placed in an error directory. The user can then run the set up batch process to determine the error.
192

Fig. 7B

Fig. 9


178
Form 1
Parameters Relating to Part(s)
Part Identification Number
Part Number
Mark Part
Batch All Parts
Material
Material 2
View Material Catalog
Alternative Material
Select Alternative Material
Use Material Key Word
Enter Material Key Word
Quantity
Enter Quantity
Use Quantity Key Word
Enter Quantity
Enter Quantity Key Word
Due Date
Enter Due Date
Use Due Date Key Word
Enter Due Date
Enter Due Date Key Word
Grain Definition
No Grain
Lock Current Orientation as Grain Direction
Use Grain Key Word
Use Grain Line
View Drawing
Select Layer
Select Font
Allow Mirrored Parts
Select Color
Common Cut for Contour Parts
No Common Cut
Yes Common Cut
External Path
Internal Path
Common Cut with Sheet Edge
Common Cut Limits
With Any Common Cut Part
Same Part Only
Same Part Same Orientation
Work Order
Enter Work Order (optional)
One Part Drawing Makes Multiples of the Same part
Drawing Makes Multiple Parts
Enter Number of Parts in Drawing
Text Location
Mark Part
Text to be Placed on Part
XLoc
YLoc
Locate on Part

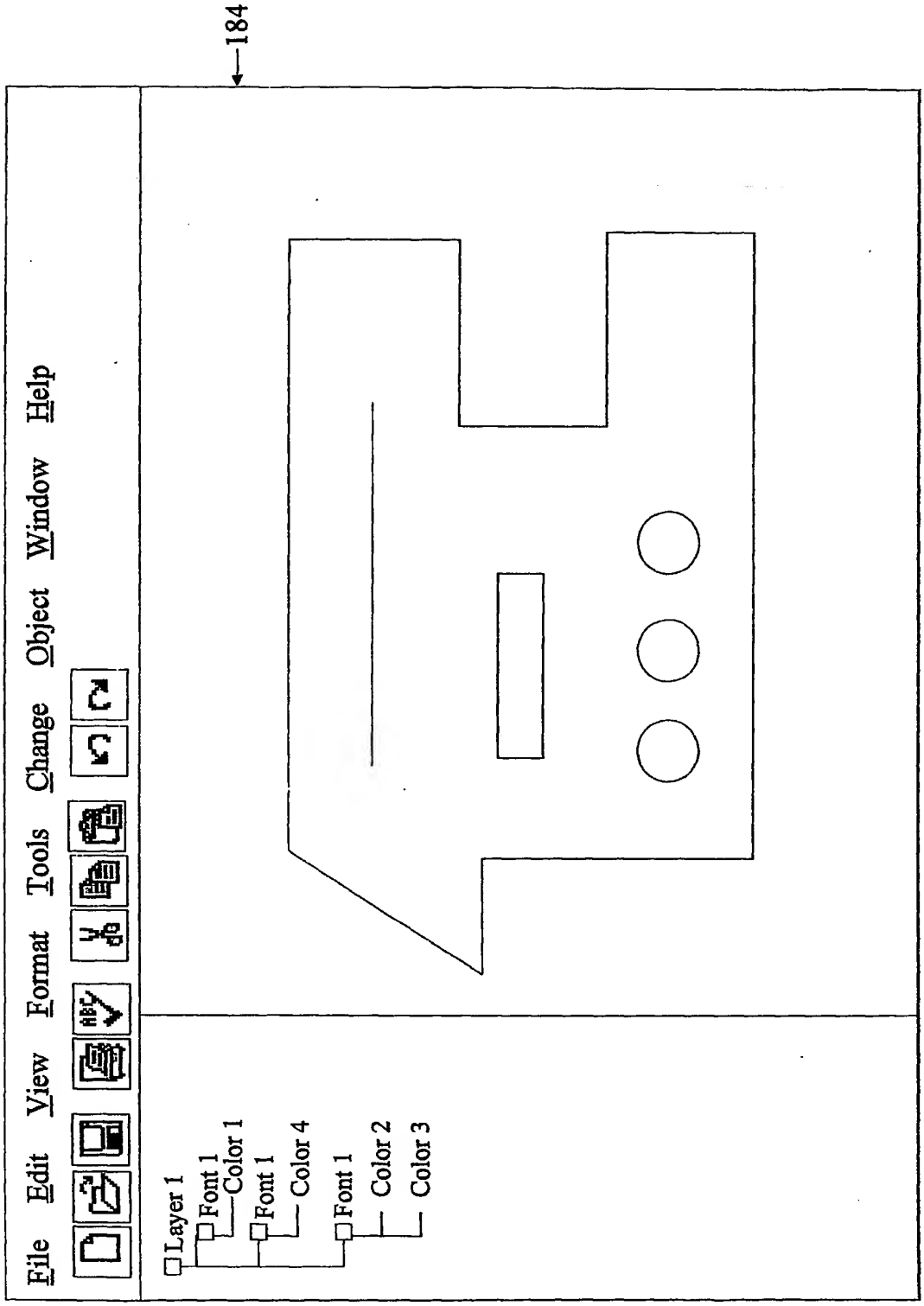

184
File Edit View Format Tools Change Object Window Help
Layer 1
Font 1
Color 1
Font 1
Color 4
Font 1
Color 2
Color 3

Fig. 10

Fig. 11

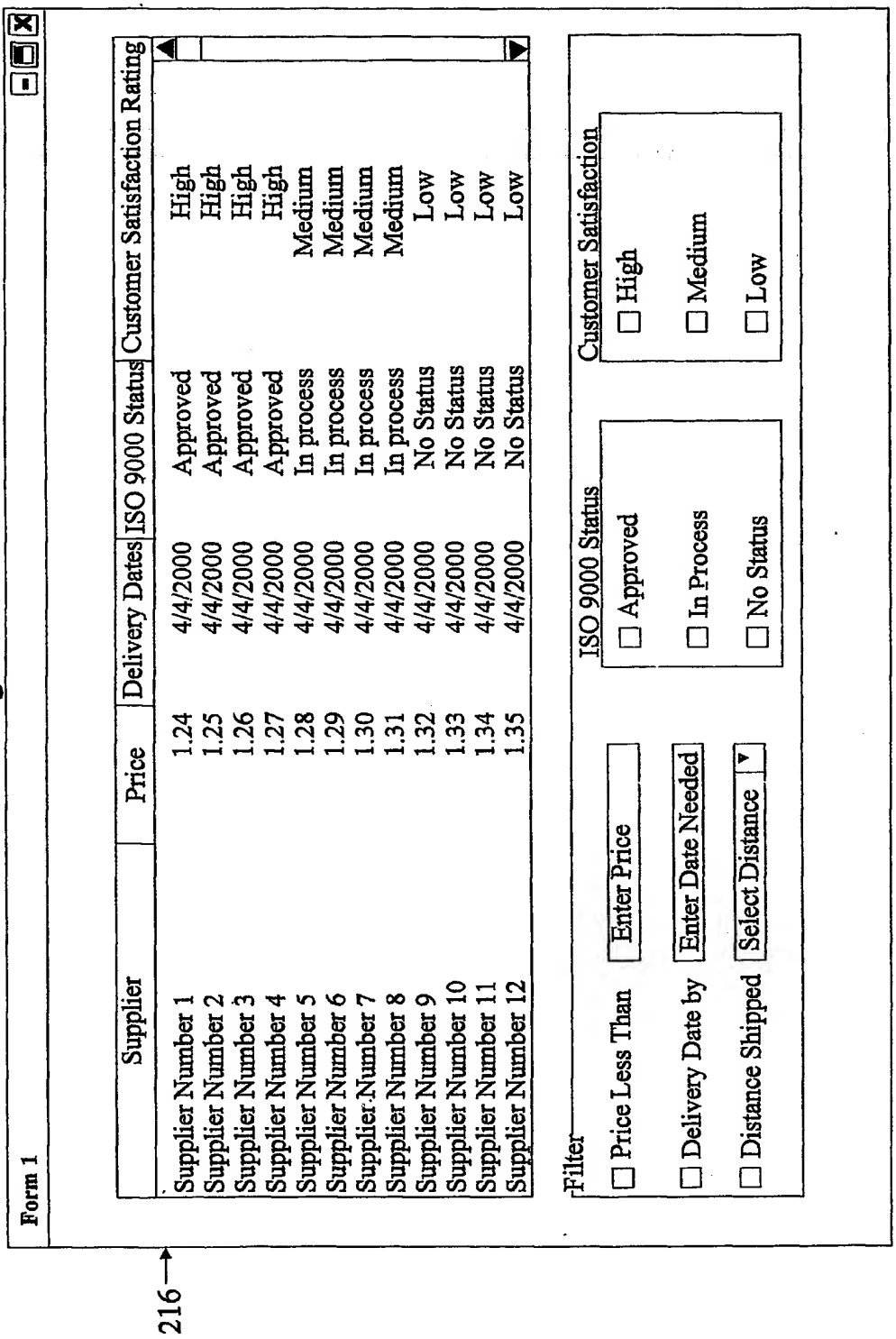
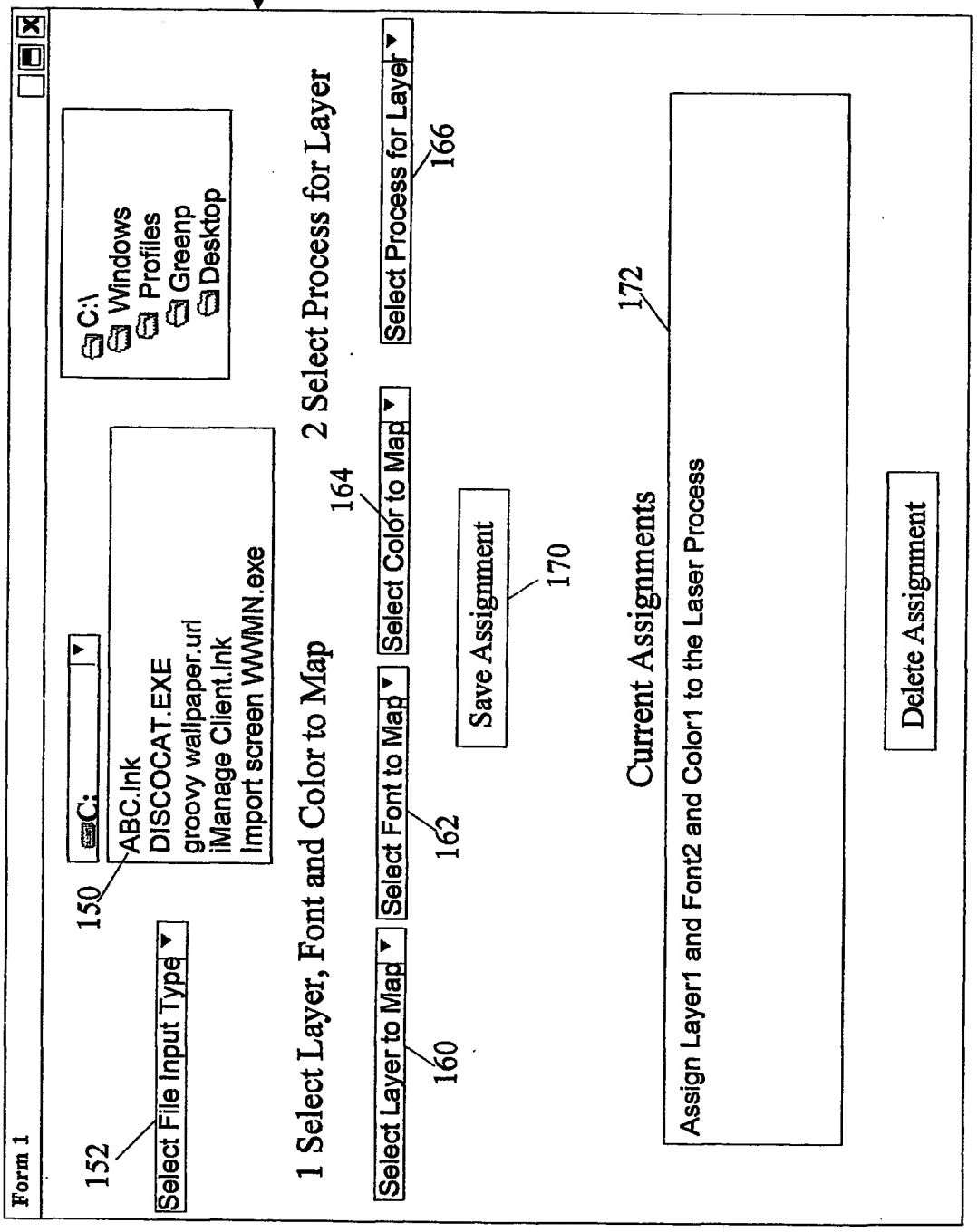

Form 1
Supplier
Price
Delivery Dates
ISO 9000 Status
Customer Satisfaction Rating
Supplier Number 1 1.24 4/4/2000 Approved High
Supplier Number 2 1.25 4/4/2000 Approved High
Supplier Number 3 1.26 4/4/2000 Approved High
Supplier Number 4 1.27 4/4/2000 Approved High
Supplier Number 5 1.28 4/4/2000 In process Medium
Supplier Number 6 1.29 4/4/2000 In process Medium
Supplier Number 7 1.30 4/4/2000 In process Medium
Supplier Number 8 1.31 4/4/2000 In process Medium
Supplier Number 9 1.32 4/4/2000 No Status Low
Supplier Number 10 1.33 4/4/2000 No Status Low
Supplier Number 11 1.34 4/4/2000 No Status Low
Supplier Number 12 1.35 4/4/2000 No Status Low
Filter
Price Less Than
Enter Price
Delivery Date by
Enter Date Needed
Distance Shipped
Select Distance
ISO 9000 Status
Approved
In Process
No Status
Customer Satisfaction
High
Medium
Low
216

Fig. 8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Form 1
C:\
Windows
Profiles
Greenp
Desktop
150
C:
ABC.lnk
DISCOCAT.EXE
groovy wallpaper.url
iManage Client.lnk
Import screen WWMN.exe
152
Select File Input Type
1 Select Layer, Font and Color to Map
2 Select Process for Layer
164
Select Color to Map
166
Select Process for Layer
Select Layer to Map
160
Select Font to Map
162
Save Assignment
170
Current Assignments
172
Assign Layer1 and Font2 and Color1 to the Laser Process
Delete Assignment